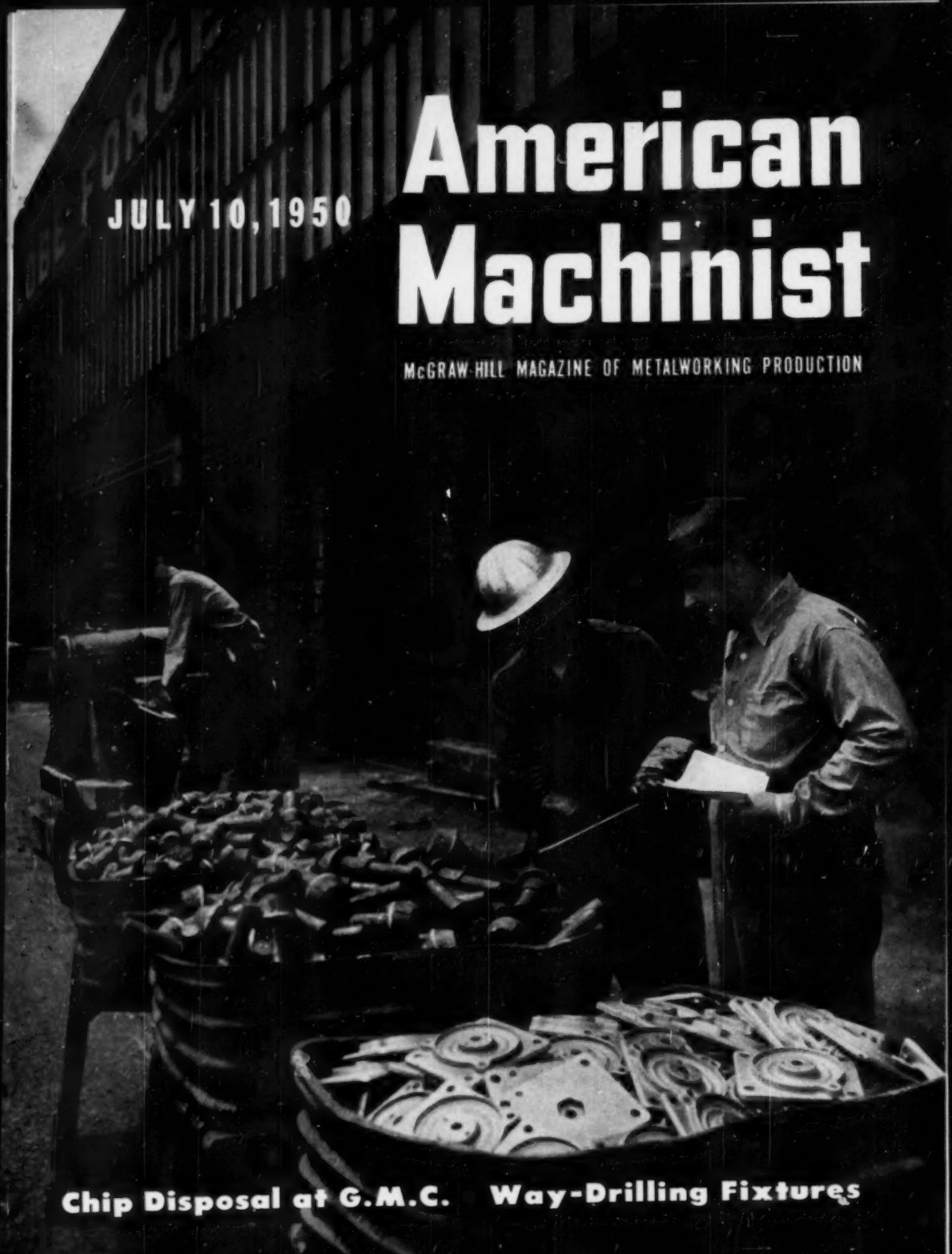
JULY 10, 1950

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



Chip Disposal at G.M.C.

Way-Drilling Fixtures

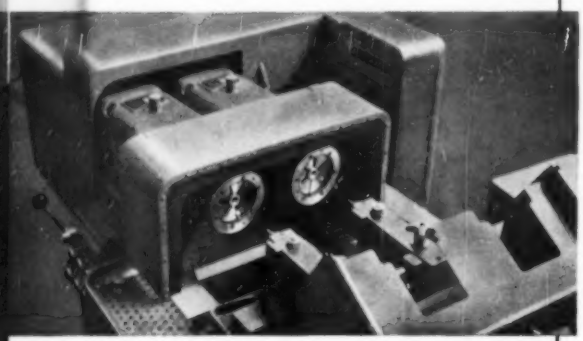
how much is an "hour's worth" of production?

—with a Heald machine, it's GREATER THAN YOU THINK!

The cost of an hour's production is pretty well fixed. But the number of parts you can finish in that time depends on the equipment used. That's why modern Heald machines can make such a big difference in your production costs.

Faster speeds and feeds — automatic cycles — easier operation — higher precision — lower maintenance — all of these Heald features combine to help you get the *most* out of an "hour's worth" of production.

Remember — when it comes to precision finishing, it pays to come to Heald.



New Heald Bore-Matic Doubles Production of tapered die castings per hour

The tapered bores of small die-cast parts were previously reamed and lapped in two separate operations. Now, with a double-station Bore-Matic setup, the entire job is done in one automatic cycle — *twice as fast as before*. The work is held in collet chucks on the two boring-heads, mounted at a 5½° angle for proper taper. The tooling, adjustable for six different sizes of die castings, is mounted on the cross slide, which indexes at the end of the boring stroke to eliminate drag lines.

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

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American Machinist

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Chips and Quips

Cooler Outside . . . Assuming July will be hot (a decision which must be made in late April to permit plate processing), we bring you an outside scene from Globe Forge, Syracuse, N. Y., a division of Barium Steel Corp. A truck has just dropped a bin of pinion-gear forgings, while the foreman and inspector look at earlier deliveries.

Pictures . . . Our editors are learning that stories can be told in pictures instead of words. Latest bit of evidence is our leading article, in which photos, as well as facts, are by Associate Editor Ashburn. It shows how Dictaphone uses fixtures to multi-drill complex frames for its new Time-Master Dictaphone, which records on a belt rather than on a wax cylinder. The switch to way drilling, incidentally, tripled production . . . Also in pictures are some tricky operations at E. W. Bliss, where mass-production methods produce presses. This issue is full of pictures, by the way—our Special Report and the "Save Parts" article are also picturized.

Replacement . . . We've been featuring equipment replacement plans recently, feeling that they're something you should know about. Latest in the series is the method at Chapman Valve, involving survey of actual vs. allowed depreciation and a special fund.

Milling . . . Mario Martellotti continues his current series with the first of five articles on selecting production-milling processes. The others in the series will follow as quickly as we can prepare them.

Facing Facts . . . Bryant Chucking Grinder had a good thread gage—either portable or bench models—and inquiries flowed in. But only four of every hundred inquirers became buyers because the price was too high. So Bryant went counter to current trends and priced its gages *into* the market—by complete redesign. We show you, in pictures, how the job was done. There's a moral here for anybody—that the first design for a product may not be the best, and that redesign from basic principles is preferable to modification.

Pipe for Chips . . . GMC Truck put in an unusual chip conveyor a while ago—a pipe unit that provides quick gravity loading by one man, is free of dust, segregates materials positively, and saves space. We asked Sidney Reibel, materials-handling consultant for Albert Kahn Associated Architects & Engineers, to tell you about it. His sketches make it all very clear and understandable.

Cost Cutting . . . Two articles stress cost cutting, one on scrap, the other on assembly. A. M. Scherer and A. Hartman tell how a materials review cuts scrap losses for Wright Aeronautical, while John Evans of Allis-Chalmers explains how induction silver brazing of stress-relieved rings cuts assembly costs.

Coming . . . July 24 *AM* includes a Special Report we've planned for a long time, or one part of it. We've wanted to give you the fundamentals of automatics, to differentiate between types. This section will cover modern multi-spindle bar machines. There'll be long articles on tube and bar bending, and heat-treating crawler-tractor gears. Then we explain how Chris-Craft combined design and production planning to produce a better, cheaper outboard engine, show how paper templets guide a punch and how one plant attains tolerances to millionths of an inch. There's more of Martellotti, some Shop Shots from Dictaphone, and several shorter articles.

RAWSON L. WOOD

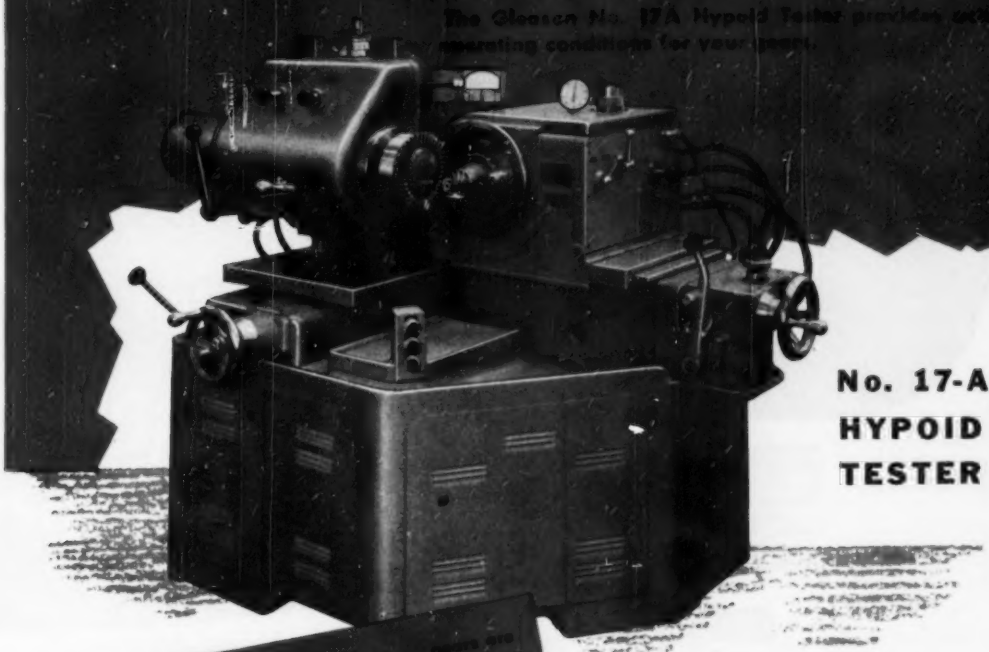
has been in the investment-casting field for more than 17 years, the first eight years as vice-president and treasurer of J. R. Wood & Sons, Inc., devoted to investment casting of jewelry. With the outbreak of World War II, he turned his attention solely to production of industrial castings. This required the setting up of a new organization, designing new equipment, new dies and new controls. Arwood Precision Casting Corp., Brooklyn, N. Y., was the result, and Mr. Wood is now its president. He is a 1930 Harvard graduate, and collaborates on our current Special Report with . . .

DAVIDLEE VON LUDWIG

a consulting materials engineer of Brooklyn, N. Y., was graduated from Long Island University in 1939, went on to study physics at Columbia. He was an experimental engineer for Wright Aeronautical for a year, then chief materials inspector for Sperry Gyro for a year, then consultant to the WPB. Since 1942 he has been an independent consultant for many aircraft makers here and abroad on materials application and control, particularly in foundries. He has managed several small foundries, done some design work, applied controlled atmospheres, worked out special heat treatments, invented numerous metallurgical processes.

QUALITY CONTROL FOR YOUR BEVEL GEAR MANUFACTURE

The Gleason No. 17A Hypoid Tester provides actual operating conditions for your gears.



No. 17-A HYPOID TESTER

Just cutting bevel gears isn't enough . . . Gears are used in units where unusually good operation is often essential. They have to operate under extreme loads at top speeds with accurate transmission of power. Just how these gears are being manufactured and how uniformly with which they are being assembled can be easily determined. For the No. 17A Hypoid Tester can be simply set up and a constant check can easily be made to determine bad quality results . . . Results, for longer lasting smoother operating bevel gears.

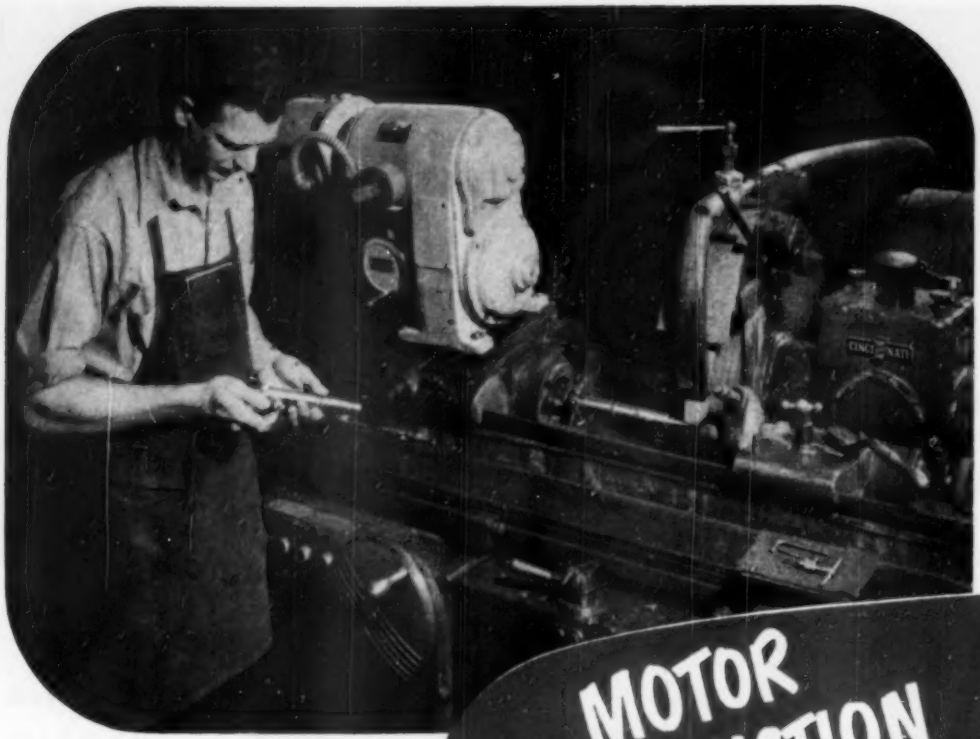
BEFORE PRODUCTION—to establish the correct setup for the gear cutting machine.

DURING PRODUCTION—to maintain uniform quality of the cut gears.

FINAL TEST—to find the best running quality of the gears for assembly . . . eliminating costly fitting or tearing down and rebuilding of assemblies.

GLEASON Works
1000 University Avenue
Rochester 3, N. Y., U. S. A.

Builders of Bevel Gear Machinery for Over 85 Years

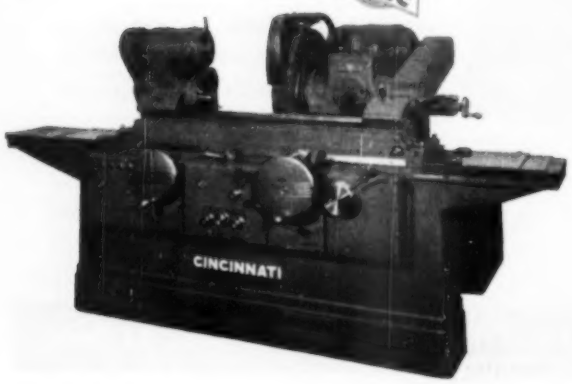


MOTOR PRODUCTION HUMS..

The infeed grinding cycle proceeds automatically while the operator of this CINCINNATI FILMATIC 6" Plain Hydraulic checks the work. Part name . . . shaft. Operation . . . grind diameters. Finish produced . . . 4 to 6 micro-inches. Production (one infeed ground diameter) . . . 104 per hour.

CINCINNATI

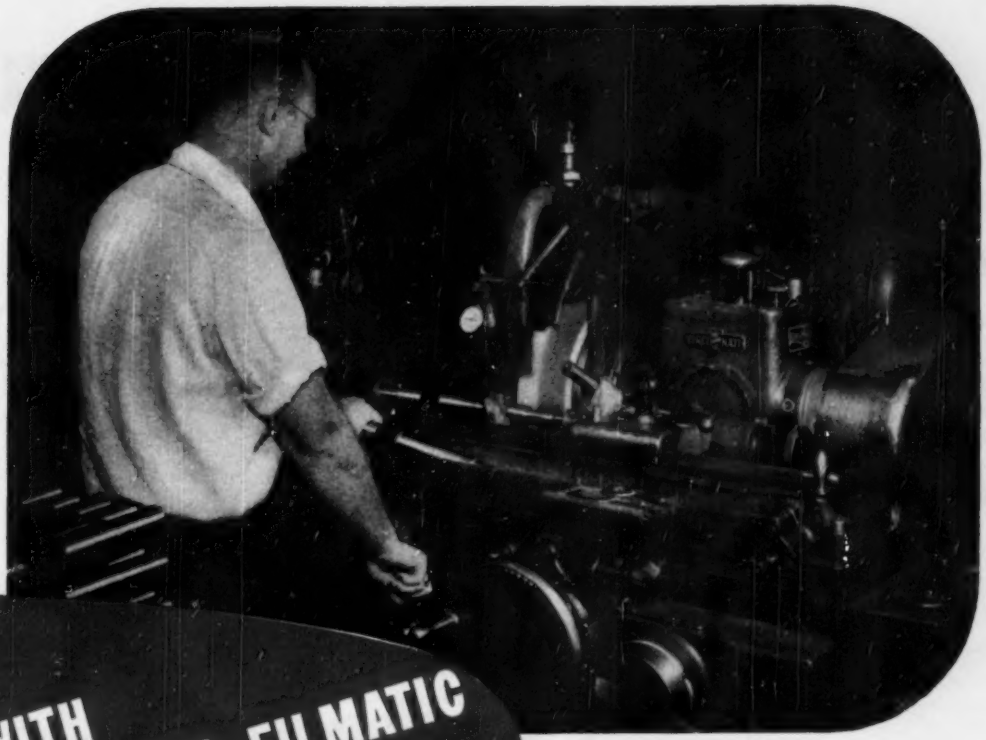
FILMATIC



REPLACE WITH A *NEW* CINCINNATI

CINCINNATI FILMATIC 10"-L Plain Hydraulic Grinding Machine. Complete specifications for 6" and 10"-L machines may be obtained by writing for catalog No. G-566

CINCIN



..WITH CINCINNATI FILMATIC GRINDERS IN THE LINE

Motor shafts are ground in a jiffy on a CINCINNATI FILMATIC 6" Plain Hydraulic Grinding Machine . . . automatic infeed for the short sections; conventional traverse for the longer sections.

As production goes, so go profits and high wages. And to keep production going, machines must be reliable; they must not overly fatigue the operator. Both of these conditions are licked for good by the two CINCINNATI FILMATIC Grinders illustrated here, installed in the plant of a prominent electric motor manufacturer.

OPERATOR PREFERENCE

The men like to run these CINCINNATIS because they're easy to operate. Automatic infeed, for example, employed in grinding short lengths to size, is initiated by one lever. Then the complete grinding cycle follows automatically, including starting and stopping of work rotation and coolant . . . no additional manual effort. Operators like CINCINNATIS for other reasons, too, such as convenient grouping of controls, and self-adjusting FILMATIC spindle bearings.

MACHINE RELIABILITY

You can always count on CINCINNATI FILMATIC Grinding Machines. They are sturdily constructed to remove metal rapidly to a high-quality finish. In the illustrations above, a finish of 4 to 6 micro-inches is produced on motor shafts. FILMATIC grinding wheel spindle bearings outlast the machine; they're self-adjusting; they require no more than token attention.

When replacing productively obsolete machines or purchasing new equipment, operator preference and high degree of machine reliability are the factors to look for. CINCINNATI FILMATICS have them. Ask for literature.

NATI

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

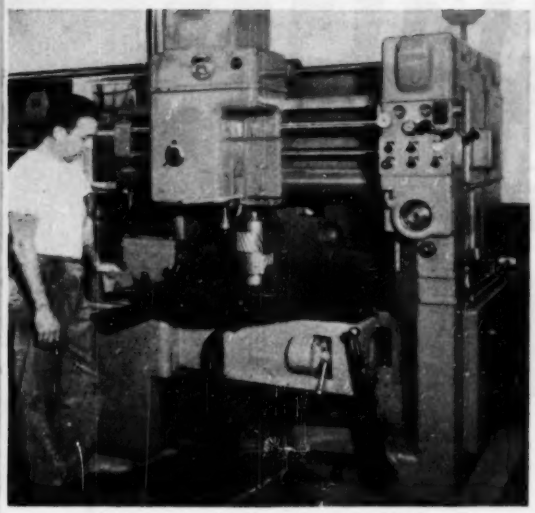
CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

GEARS...without

GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

Growl... FOR MARINE PROPULSION



The Fellows No. 36 Gear Shaper installed for cutting production-run quantities of speed reduction and reverse gears at Snow and Nabstedt Gear Corp., New Haven, Conn.

The massive rigidity of this big No. 36 Gear Shaper opens up broad avenues of time saving in the cutting of heavy-duty precision gears with helical, spur or herringbone teeth... Power to hog out stock and precision to hold finish cuts to "tenths"... Speed and feed changes made in seconds... Well worth investigating! Complete literature on request.

ROUGHING AND PRE-SHAVING PERFORMANCE

at Snow & Nabstedt Gear Corp., New Haven, Conn. —manufacturers of S-N Marine Reverse and Reduction Gears.

•

WORK: 57-tooth Herringbone Gear, 14.250 inches P.D.... and 25-tooth Mating Pinion, 6.250 inches P.D. (both SAE 8620 steel)

TOOTH CHARACTERISTICS:

Diametral Pitch	4/5
Pressure Angle	20 degrees
Helix Angle	23 degrees
Face Width	3.375 inches
Whole Tooth Depth	.475 inches

GEAR SHAPER SETTING:

Strokes per minute	86
Feed per stroke	.0225 inches

ROUGHING TIME:

(Material Normalized Prior to Cutting)

Gear (in one cut)	26.5 minutes
Pinion (in one cut)	13.5 minutes

PRE-SHAVING:

(After Carburization)

Gear (in one cut)	23.5 minutes
Pinion (in one cut)	10.5 minutes

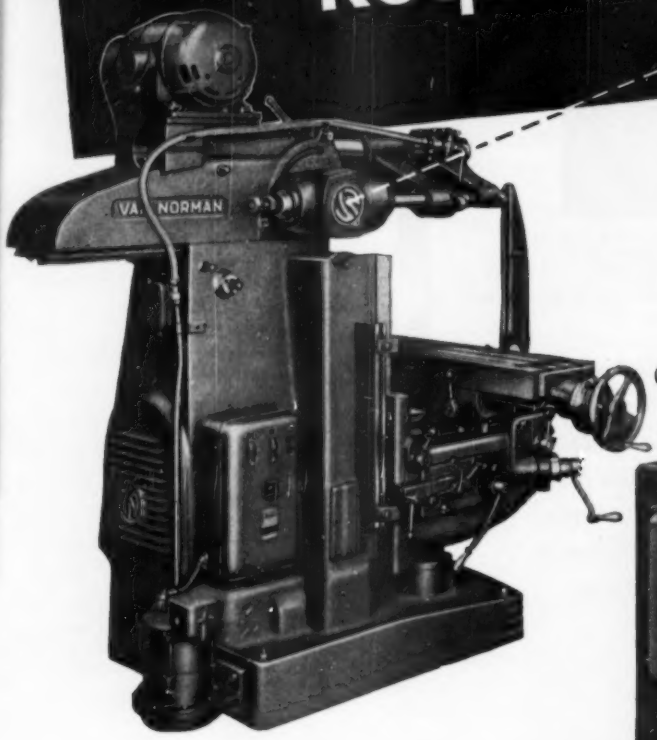
SAME GEARS SHAVED ON FELLOWS SHAVING MACHINES

with minimum stock removal, minimum correction needed.

Fellows

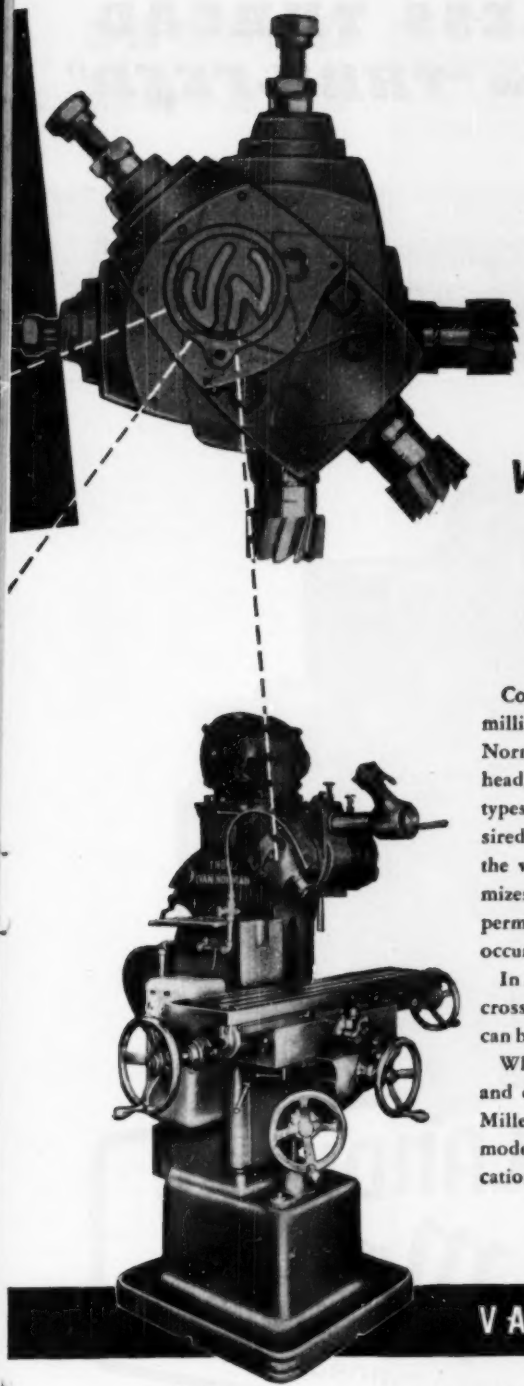
THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department, 78 River Street, Springfield, Vermont, U.S.A.
Branch Offices: 616 Fisher Bldg., Detroit 2 • 640 West Town Office Bldg., Chicago 12 • 2206 Empire State Bldg., New York 1.

ADAPTABILITY
To Meet Milling Requirements



No. 22L
Table: 45" x 10"

No. 16
Table: 37" x 9½"



No. 12
Table: 37½" x 9¾"

IT'S THE ADJUSTABLE CUTTERHEAD

That Enables ONE Van Norman Ram Type Miller Do the Work of Several Single Purpose Machines

Conventional horizontal and vertical, as well as angular milling all on ONE miller . . . that's what you get with Van Norman Ram Type Milling Machines. The adjustable cutterhead, mounted on a movable ram, enables you to perform all types of milling by simply positioning the cutterhead in the desired position. Not only does this important feature give you the workability of several single machines, but it also minimizes work set-ups . . . cuts idle machine and operator time by permitting you to meet job to job milling requirements as they occur.

In addition, the movable ram in combination with the saddle cross feed increases the work range and capacity of work that can be handled.

Whether it is for toolroom, production, machine shop, tool and die shop, or laboratory work, Van Norman Ram Type Millers increase production and cut costs. A wide range of models in various sizes are available to fit most every application. Write for information.

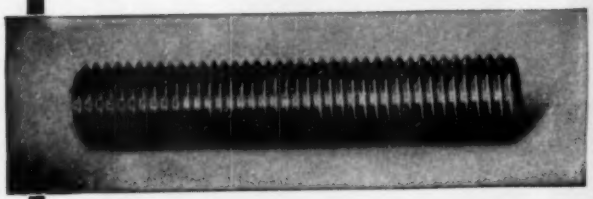
VAN NORMAN COMPANY

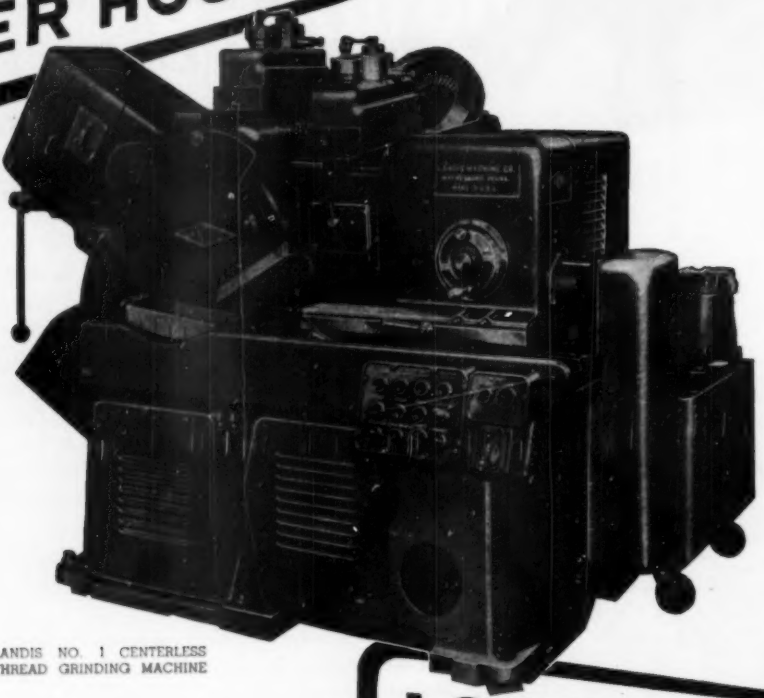
SPRINGFIELD 7, MASSACHUSETTS

"It Pays to Van Normanize"

CENTERLESS THREAD
by the *"THRU-FEED"*

210 STUDS PER HOUR



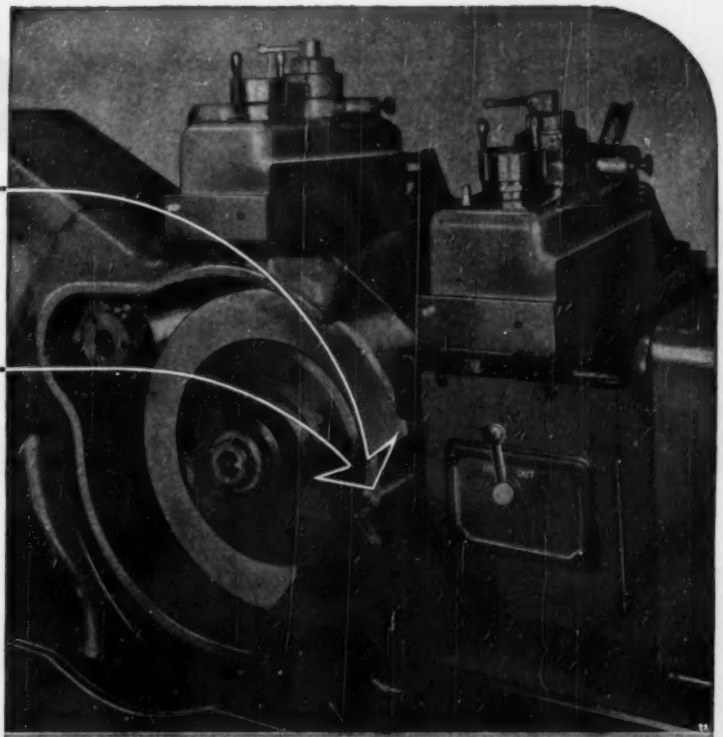


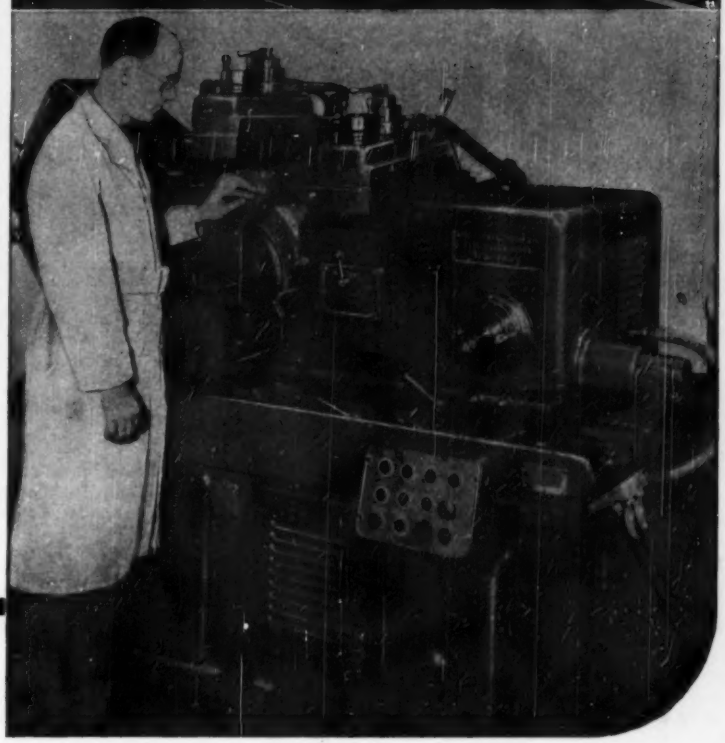
LANDIS NO. 1 CENTERLESS
THREAD GRINDING MACHINE

LANDIS Machine COMPANY
WAYNESBORO · PENNA · U.S.A.

GROUND METHOD

Name of Part	Stud
Thread Specifications:	
Diameter	¾"
Pitch	10 USF
Thread Length	4"
Thread Tolerance	Class 7
Production Per Hour	210





The LANDIS No. 1 Centerless Thread Grinder is designed to grind screw threads on straight cylindrical workpieces and headed or multiple diameter parts.

Workpieces without interfering shoulders requiring threads on the maximum diameter only — headless set screws, continuously threaded studs, etc.—pass through the machine in a continuous flow (as illustrated) with no time lost for loading or unloading. The "thrufeed" method will grind $\frac{1}{16}$" to 4¾" diameter threads to unlimited lengths.

Headed or shouldered workpieces—cap screws, stripper bolts, etc.—are placed between the wheels one at a time and ejected automatically. The thread is ground in about 1½ revolutions of the part and close-to-shoulder threads are permitted. The "infeed" method will grind $\frac{1}{16}$" to 4¾" threads up to 7¾" in length.

Either process will grind threads from the solid or finish grind precut threads. Most types of thread forms can be ground to any required class of fit and for right or left hand threads.

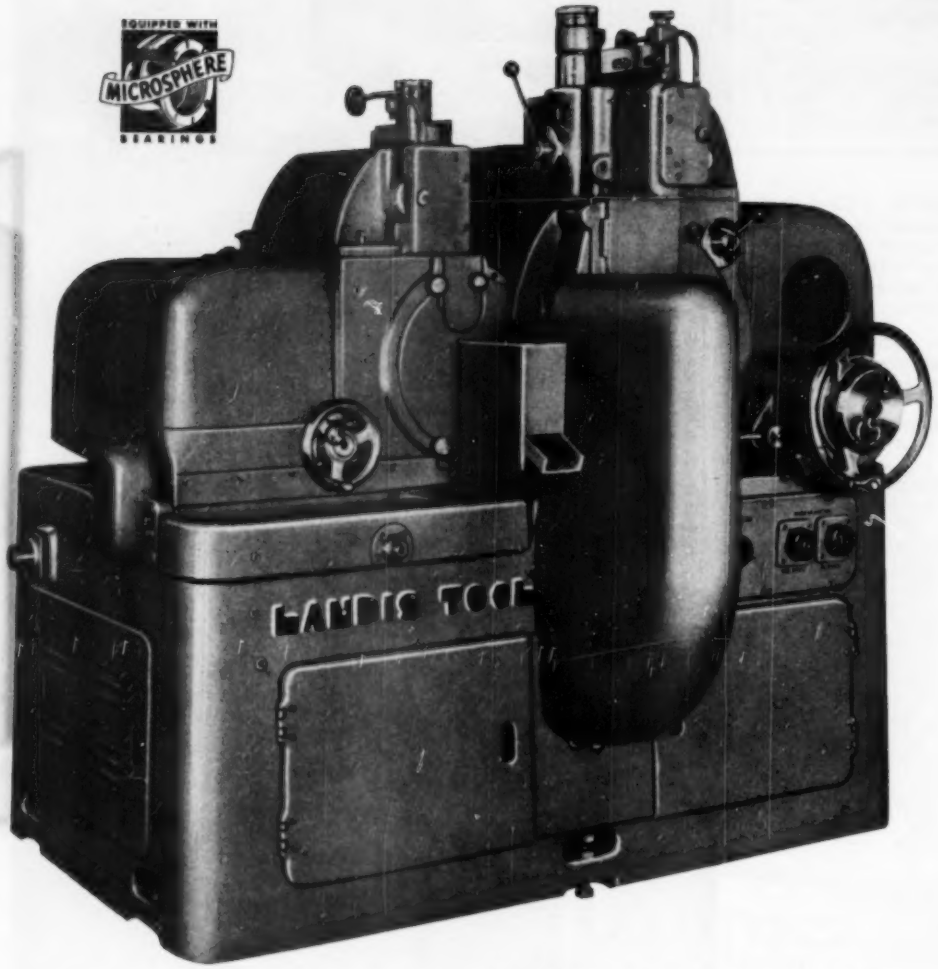
Write for Bulletin E-97

LANDIS TOOL COMPANY

LANDIS TOOL

precision centerless grinders

EQUIPPED WITH MICROSPHERE BEARINGS



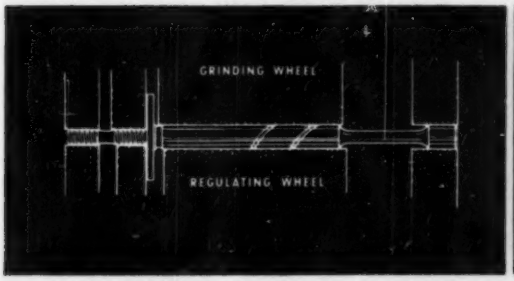
No. 12—Landis Tool Centerless Grinder with Timed Cycle Loader; Catalog T47

115

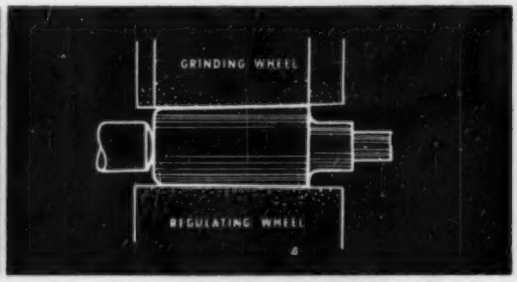
LANDIS TOOL *Precision Grinders*

Production estimates and tooling recommendations will be supplied on the basis of your blueprints.

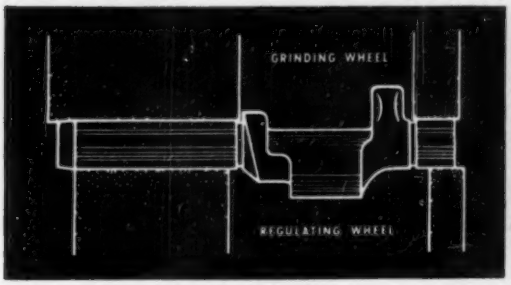
Cost reduction ideas for infeed grinding



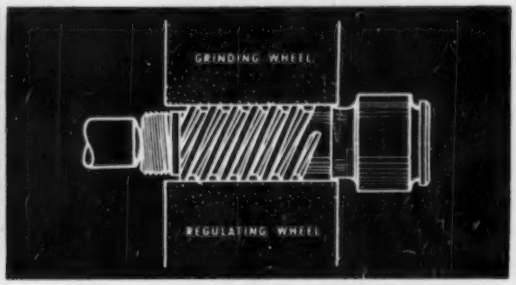
SPACED WHEEL GRINDING. With vertical power operated work loader.



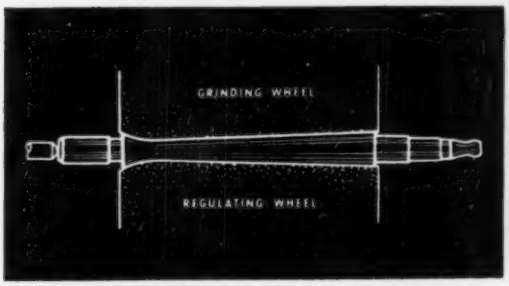
TAPER GRINDING. Swiveled regulating wheel base for maximum finish.



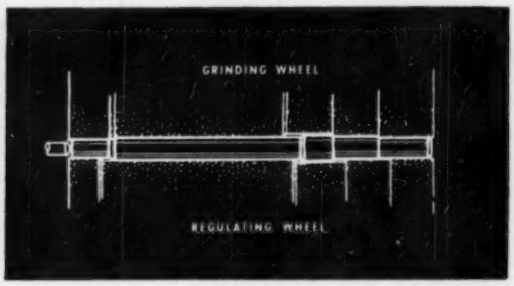
CRANKSHAFT GRINDING. With spaced wheels to clear projections.



GRINDING O.D. OF THREADS. High production with timed cycle loader.



FORM GRINDING. Both wheels profile dressed to shape.



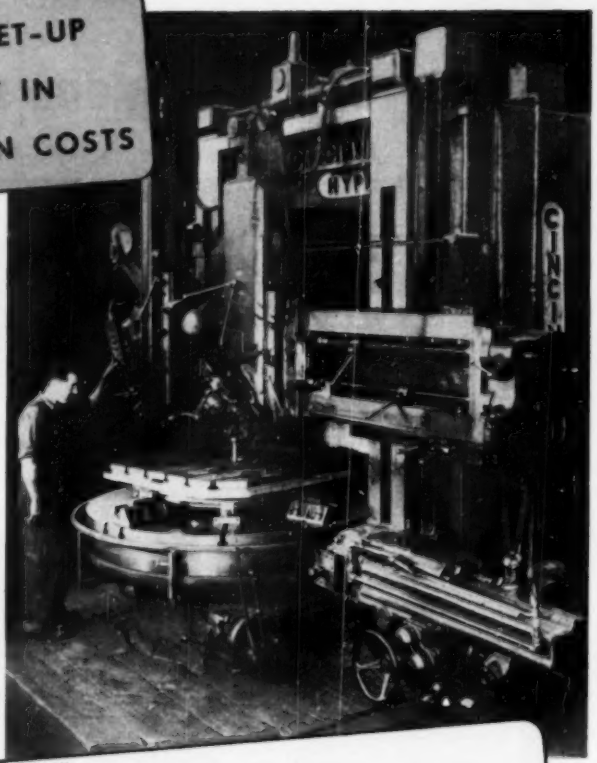
MULTIPLE DIAMETER GRINDING. 5 diameters concentric in one operation.

Special Tooling
Available for High Production Infeed Grinding.

WORK STOPS.
WORK EJECTORS. Hand or Air Operated.
PROFILE BAR DRESSING. Grinding and Regulating Wheel.
AUTOMATIC GRINDING CYCLES.
TIMED CYCLE LOADERS.
HAND OPERATED LOADERS.
VERTICAL LOADERS.

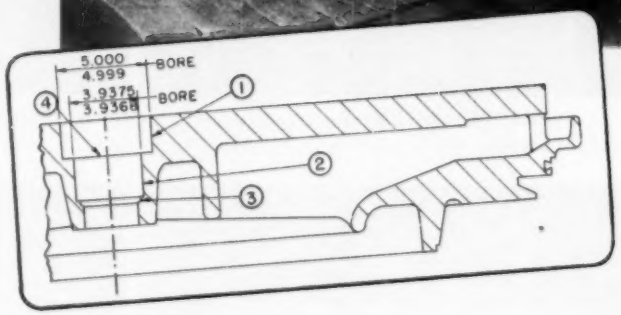
LANDIS TOOL COMPANY • WAYNESBORO, PENNA., U.S.A.

THIS SIMPLE WORK SET-UP OFFERS SHORT CUT IN REDUCING PRODUCTION COSTS



Simplicity of work set-up results in lower overall production costs. Note how this table top is chucked with face plate jaws. Similar setups on more complicated work are made just as easily.

CINCINNATI **HYPRO**



Operations and finishes are indicated in this line drawing. One bore is held to .0007" which is not unusual for this machine.

Similar Parts are handled Faster and Better on a Cincinnati Hypro Boring Mill — Multiple Boring and Turning Operations Can Be Made Simultaneously On This Machine.

Time consuming and elaborate work set-ups are often unnecessary to position castings and fabricated parts for precision machining operations on the Cincinnati Hypro Vertical Boring and Turning Mill. An excellent example of a simple set-up is shown. This is a precision rotary table top and the center pin hole is being bored and turned. Four ordinary face plate or boring mill jaws are used to hold the workpiece. The table top is merely placed in position and clamped. Holding blocks interspaced between the jaws rigidly support the work.

The turret of the right hand head is tooled to rough and finish bore and to turn the bottom of the counter-bore in this center pin hole. Were additional operations required, more tools could be mounted on the turret, the left hand swivel head and the side head.

All heads on the machine may be operated independently or simultaneously. A pendent station is always convenient to the operator to eliminate awkward positions in the control of the machine.

A surprising number of castings and weldments requiring a broad range of operations can be handled just as effectively and almost as simply as this precision rotary table top. *You can save work handling time, setup time and machining time when you use Cincinnati Hypro Boring Mills.* An inquiry now directed to experienced Cincinnati Planer Company engineers may easily result in better machining methods that will drastically cut your overall production costs.

HYPRO

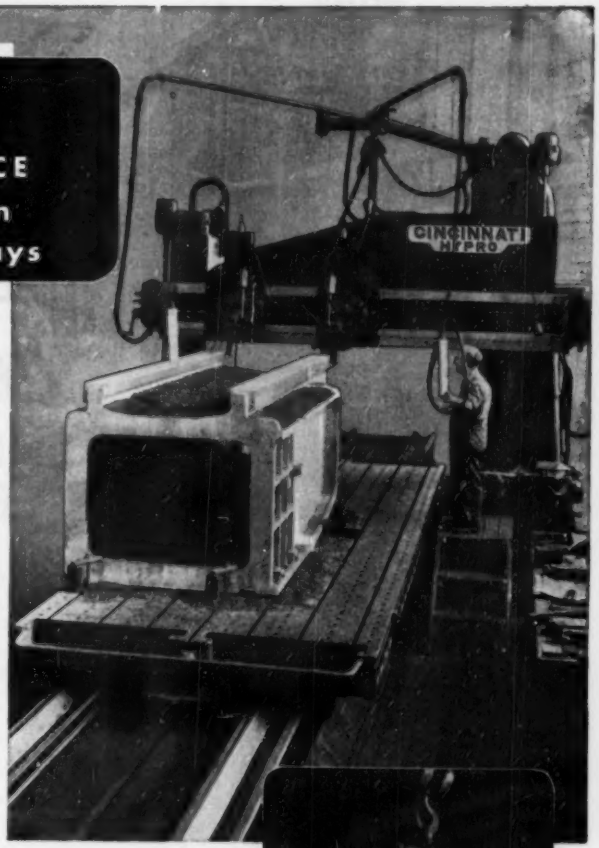
A Cincinnati Hypro Vertical Boring Mill catalog will be sent Free upon request. Kindly ask for catalog No. 133.

THE CINCINNATI

Subsidiary of Giddings & Lewis Machine

- **PARALLELISM**
- **FLATNESS**
- **CENTER DISTANCE**

held to .001" on 202" column ways



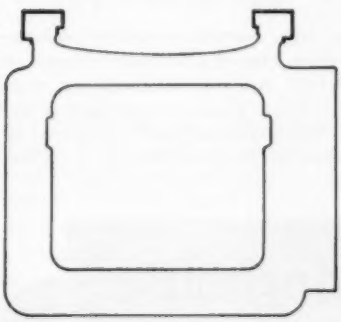
7 Bearing Surfaces on Each Way Require 30 Separate Cuts . . . 2 Heads Operate Simultaneously to Reduce Overall Planing Time . . . Job Completed in 17 Hours on Cincinnati Openside Planer

Bearing Ways on this huge machine tool column obtain their basic accuracy through planing. Parallelism throughout 202" length on top, sides and bottom, flatness on bearing widths and center distance relationship are maintained at .001". This unusually close machining requirement is essential to insure final working accuracy of the assembled machine tool.

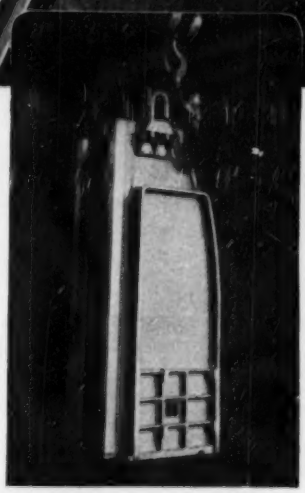
You can depend on Cincinnati Planers to produce both finish and accuracy needed for heavy, cumbersome parts such as this column, or for relatively shallow, fragile work where warpage or distortion may create a problem.

Two Cutting Heads Operate Simultaneously On Each Bearing Way

The line drawing shown below indicates the finish surfaces required to complete the bearing ways. Two heads on the rail operating from separate feed screws speed the overall planing time on this part. In addition, dimensional relationships are held on all seven bearing surfaces with each other and with each way.



Planing large or small parts, as a single unit or in multiples, may easily mean added profits for you. Check now with Cincinnati Planer engineers for their recommendations.



Box type bearing ways on this huge column are planed on four sides.

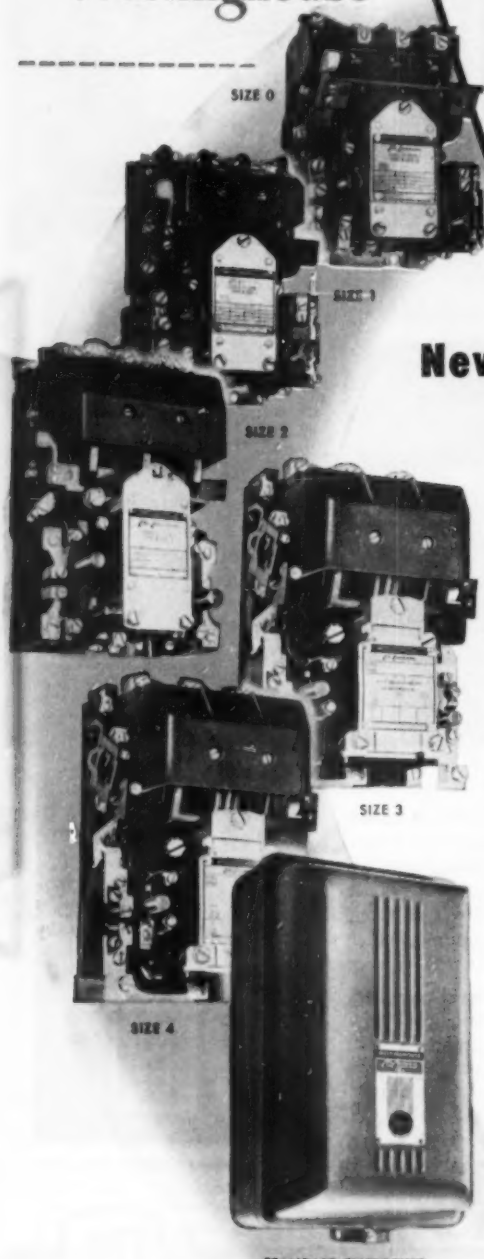
PLANER COMPANY

Tool Company, FOND DU LAC, WISCONSIN, U.S.A.

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

IT'S NEW! COMPLETE! UNIFORM!



*Life-Linestarter**

New Dollar-saving Teammate for A-C Motors

- **for production-conscious users** of motor control
- **for cost-conscious executives** looking for ways to reduce operating expenditures and inventories
- **for machinery manufacturers,** who want to offer maximum continuity and ease of service to their customers . . .

  plus initial savings in starter installation

  plus greater machine salability resulting from compact size, uniform wiring, simplified construction

The new Life-Linestarter is a major advancement in motor control. It's the culmination of 40 years' experience and more than six years of laboratory tests and field trials . . . thoroughly field-proved through wide use under actual operating conditions. It offers more starter per dollar . . . on every count.

Life-Linestarters are best because they offer uniformity and completeness of line . . . uniformity of appearance and construction.

Also check these other features—superior performance, positive operation, ease of installation—found in detail in Booklet B-4677. Ask your Westinghouse salesman for a copy of a Trans-Vision presentation of the new Life-Linestarter. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-30020

*Trade Mark

Westinghouse *Life-Linestarter*

TOMORROW'S STARTER—**TODAY!**

Buried Treasure

in Your Product?

More than likely... if you can dig up New Ways to make it do more for your customers ...by COUNTING

No. 1239 Predetermining Counter signals operator or actuates mechanism to stop machine at end of pre-set run.

Dig deeply into this million-dollar question: "How could *my* product increase its usefulness and sales . . . *by counting?*" And you may well uncover a new and distinctive merchandising appeal that will set your product apart from competition . . . as so many manufacturers have done.

It's as simple as this: If your product is mechanically or electrically operated, then it's definitely worth a search to see if there's hidden sales-treasure buried there. This can be quickly determined by some fast spade-work done by a Veeder-Root engineer, paired off with your design engineer. And the digging can get under way . . . *any time you say.*

Write for 8-page "Counter Book" which shows all types of V-R electrical, mechanical, and manual counters . . . standard and special.

VEEDER-ROOT INC., HARTFORD 2, CONN.

In Canada: Veeder-Root of Canada, Ltd., 955 St. James Street, Montreal 3. *In Great Britain:* Veeder-Root Ltd., Kilspindie Road, Dundee, Scotland.

Veeder-Root COUNTERS

Parts to Ultra-fine Finishes
Parts to Ultra-close Dimensions

Type 16FC Lapping Machine—The vertical lapping machine that produces optically flat surfaces and thickness *tolerances in millionths*. Catalog No. 212-2 for details.

SEAL-O-LAP Single Surface Lapping Machine—The machine that produces *superior seal surfaces* on seals of metallic or non-metallic composition. Catalog 215-1 for details.

No. 12 Simplex Surface Finishing Machine—The pneumatically operated machine that produces *low micro-inch readings* on diameters from ½" to 2½". Catalog 217-1 for details.

Need Not Be More Costly

That's Being Proved in Plant after Plant with NORTON LAPPERS

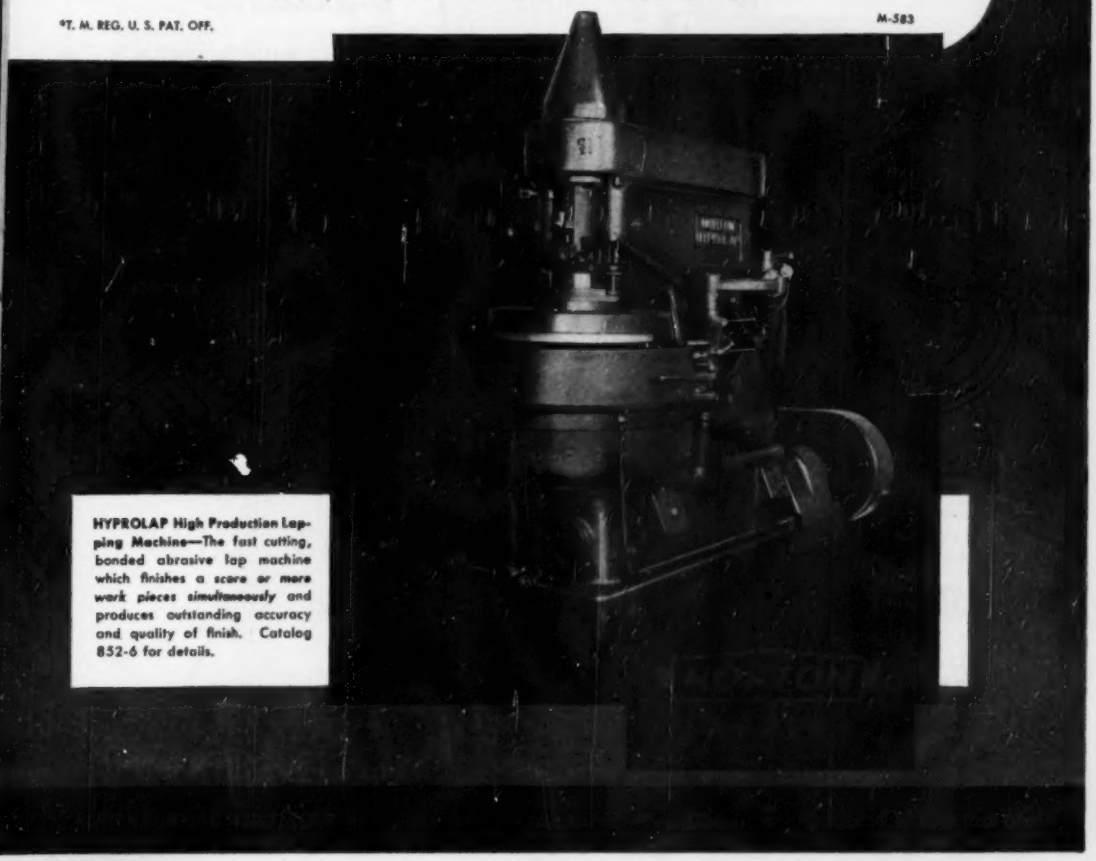
TO meet today's keenly competitive conditions designers are specifying closer and closer dimensional accuracies and finer and finer finishes. And to meet these requirements ***economically*** there's a varied line of Norton Lapping Machines—machines that range from the small 16 FC to the large, high production HYPROLAP*—machines for flat work and for cylindrical work, including crankshafts.

The ability of these Norton machines to produce uniform, ultra-fine parts makes it possible to reduce costly selective assembly and multiple inventories.

If you are looking for closer dimensional tolerances and lower micro-inch finishes at attractive cost levels it will pay you to get in touch with Norton lapping engineers.

*T. M. REG. U. S. PAT. OFF.

M-583

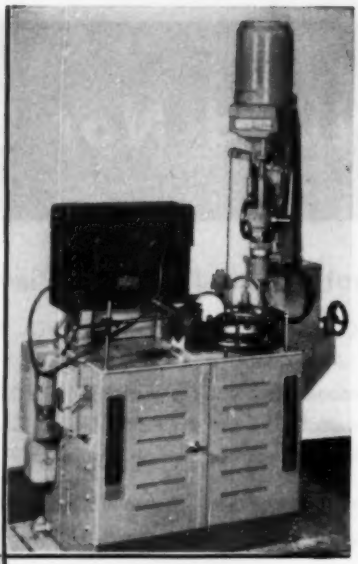


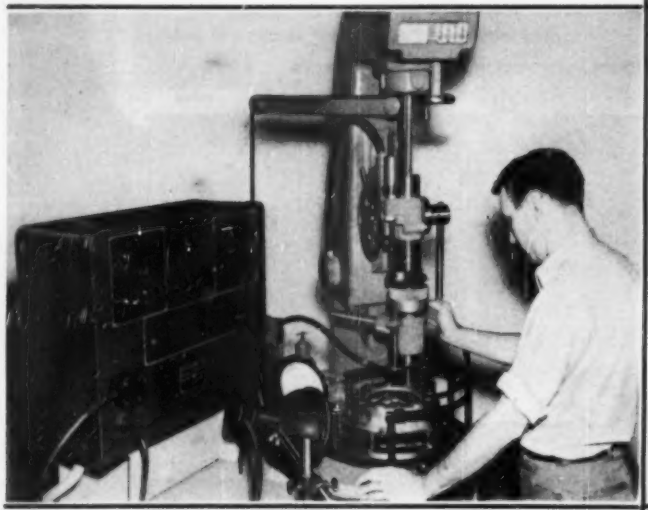
HYPROLAP High Production Lapping Machine—The fast cutting, bonded abrasive lap machine which finishes a ***score or more work pieces simultaneously*** and produces outstanding accuracy and quality of finish. Catalog 852-6 for details.

MACHINE BALANCES CLUTCH ASSEMBLIES!

Phenomenal speed and accuracy are achieved with the Gisholt machine which performs all four steps in the complete balancing operation as follows: (1) locates unbalance, (2) measures unbalance, (3) corrects unbalance, (4) checks balance. Designed especially for this work, the machine handles operations at the rate of 80 pieces per hour.

Gisholt ISV Dynetric Balancer





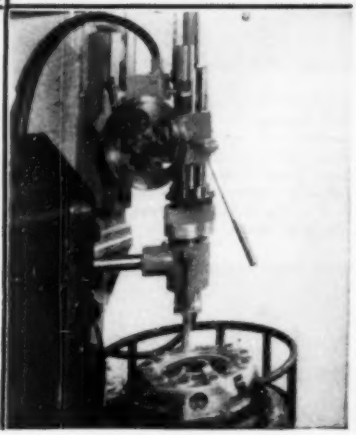
Saves handling time

With correction drill incorporated as a part of the machine, it is unnecessary to remove work piece from mounting for drilling. Handling time is cut to a minimum.

Corrections clearly indicated

Readings clearly show where and how much metal is to be removed in units of drill depth. All chips are automatically ejected so they cannot get caught in the clutch pressure springs.

Insures better service Whether it's in production or repair work, the balancing of clutch plate assemblies is of little avail unless it is done *accurately.* And here, again, the DYNETRIC principle provides the accuracy which makes Gisholt the unquestioned leader in the field of balancing. Full information on request.



GISHOLT MACHINE COMPANY
Beautiful Madison, Wisconsin

DYNETRIC BALANCERS — GISHOLT

DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION
"DYNETRIC" IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

TURRET LATHES • AUTOMATIC LATHES
BALANCERS • SUPERFINISHERS • SPECIAL MACHINES

92 hrs. of heat treatment

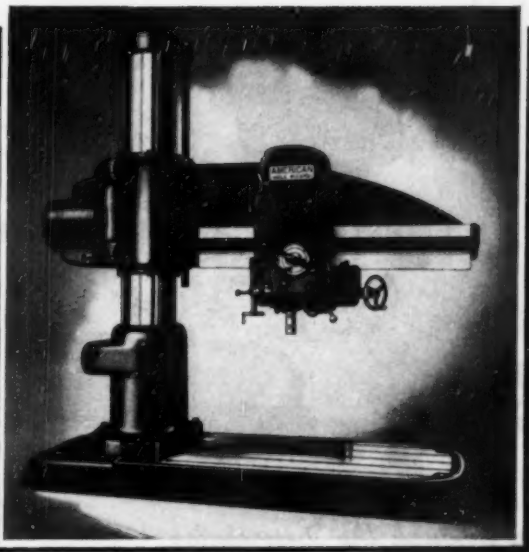
. . . required to produce the ultimate in radial drill spindles

"AMERICAN" Radial Drill Spindles are made of nitralloy. 20 hours of heat treatment from rough to finish, then 72 hours of nitriding are required to produce the wear-resistant spindles used in these radials.

Both the spindles and sleeves are nitrided to 110 degrees scleroscope. This is harder than some grades of cemented carbide. The sleeve is finish honed and the spindle ground and then diamond lapped to a sliding fit in the sleeve. Because of the lack of affinity between these two hard surfaces the clearance between them may be reduced to the very minimum, which in this case is .00025".

This results in the greatest possible stability, resulting in an ideal construction especially for accurate boring operations, which demand a high degree of smoothness and rigidity of the spindle.

This is but one of the super features that make the "AMERICAN" Hole Wizard an outstanding investment.



THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

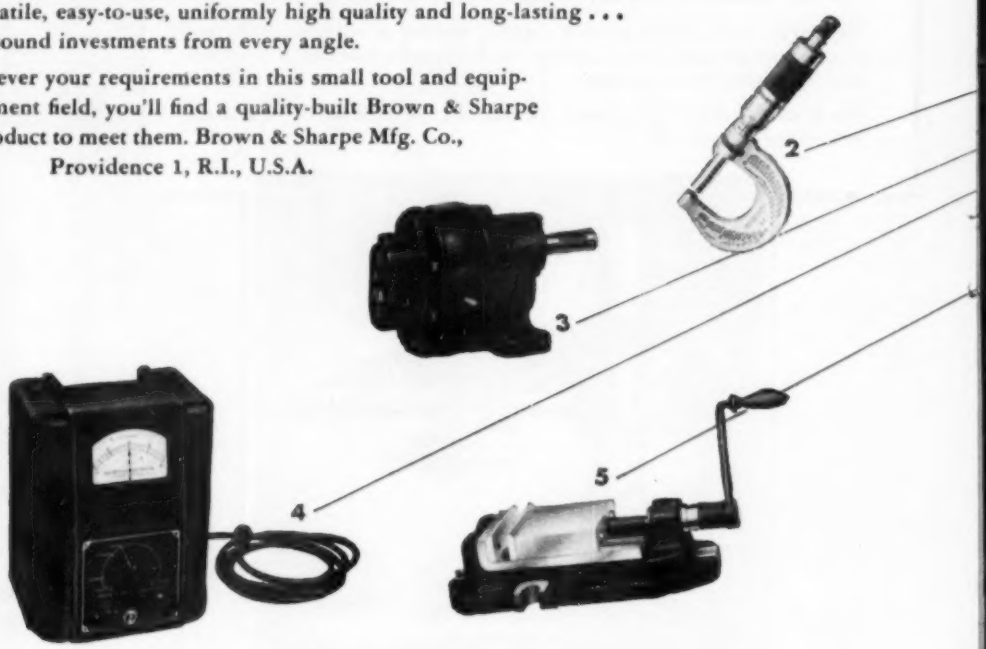
Lathes and Radial Drills

ways to keep a tight rein on

The variety of precision-built products shown here is representative of 10 different types of cost-saving small tools and equipment manufactured in complete ranges by Brown & Sharpe.

Each item has distinctive design and construction features that will help you hold a tight rein on your production costs. Some of the basic overall features include carefully selected materials, accurate workmanship with painstaking attention to details, and dependable performance. When all the features are added up, the results are products that are extremely versatile, easy-to-use, uniformly high quality and long-lasting . . . sound investments from every angle.

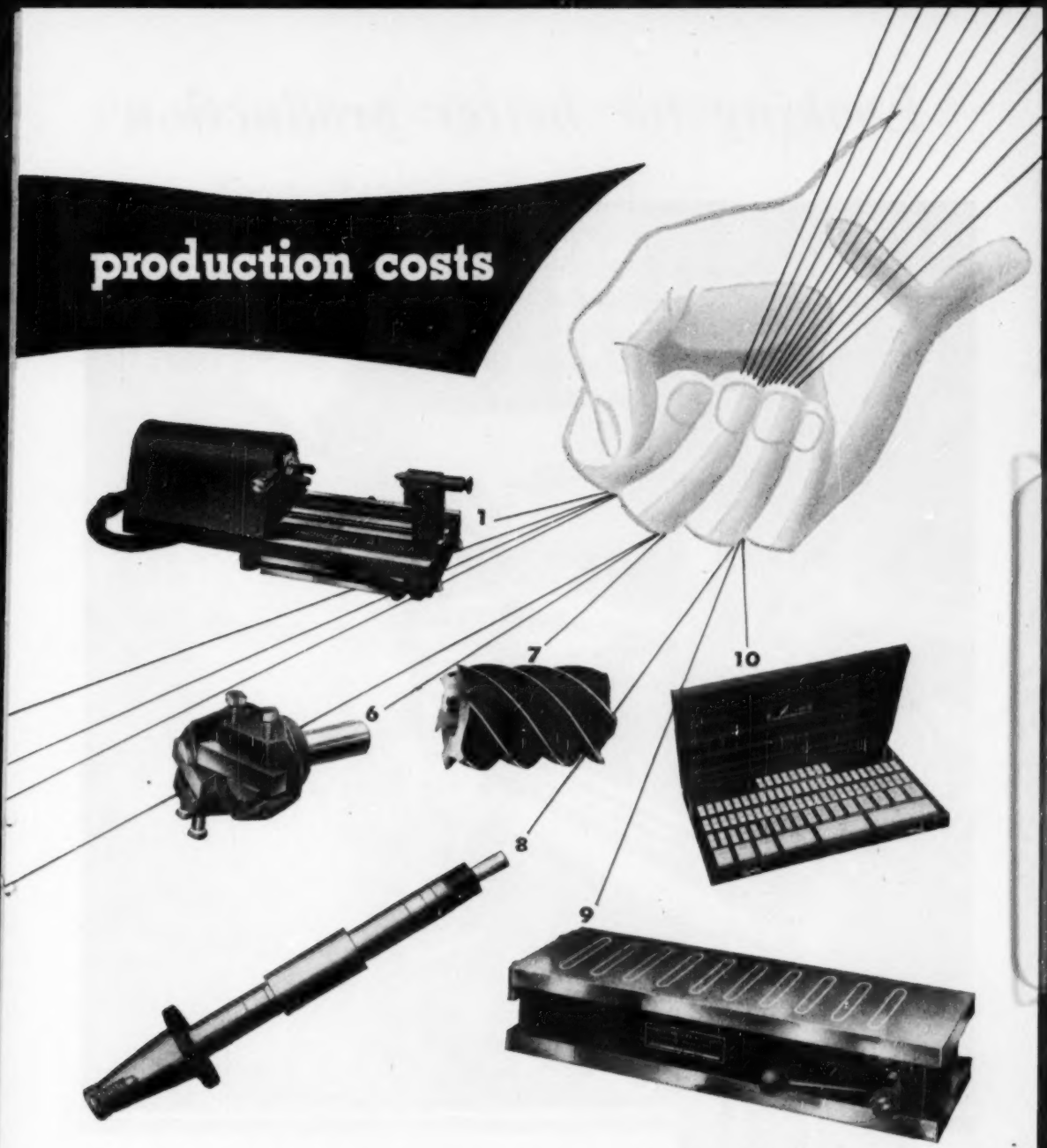
Whatever your requirements in this small tool and equipment field, you'll find a quality-built Brown & Sharpe product to meet them. Brown & Sharpe Mfg. Co., Providence 1, R.I., U.S.A.



We urge buying through the Distributor

BROWN &

production costs

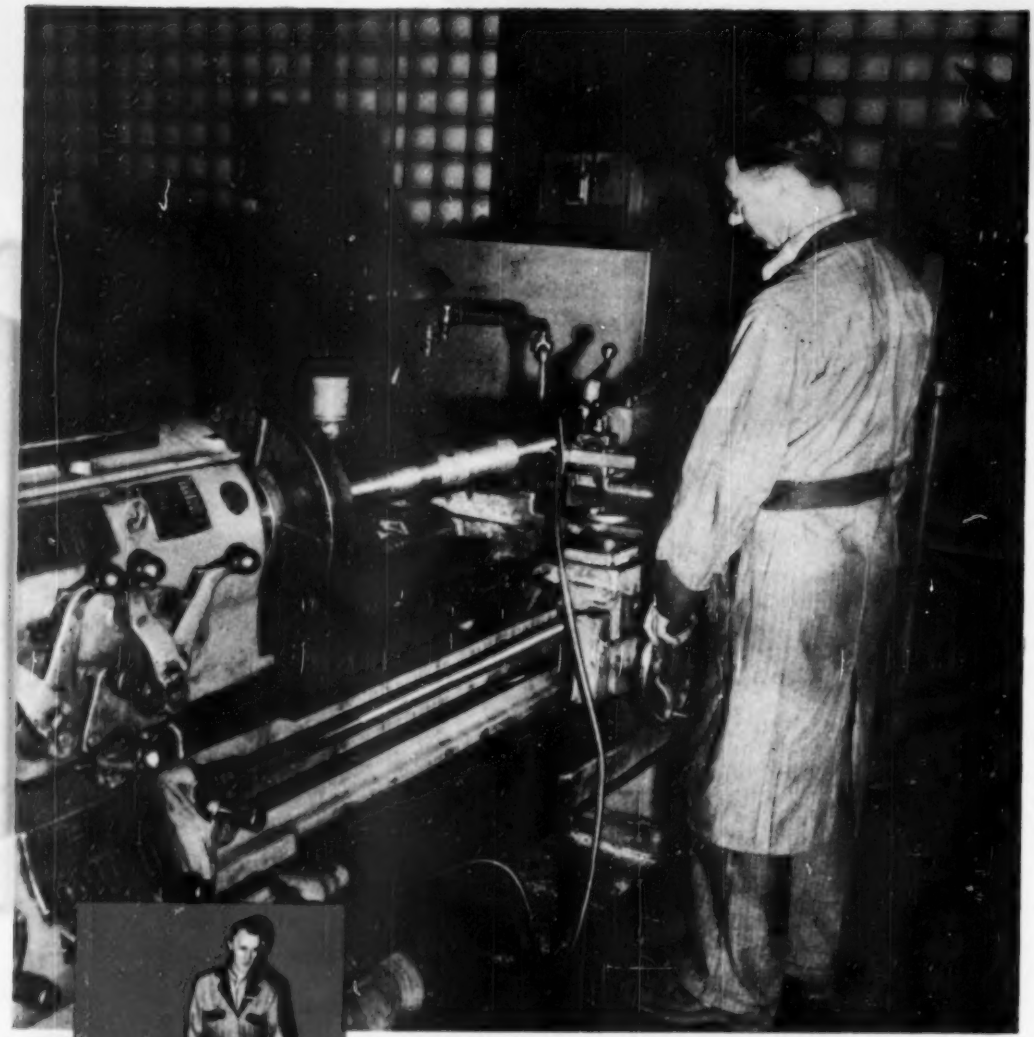


1. Cylindrical Grinding and Indexing Attachment No. 616. 2. Machinists' Tools.
3. Pumps. 4. Electronic Measuring Equipment. 5. Vises.
6. Screw Machine Tools. 7. Milling Cutters. 8. Arbors, Adapters, and Collets.
9. Permanent Magnet Chucks. 10. Johansson Gage Blocks.

SHARPE

B·S

Looking for better production



Here, a change to Free-Cutting CARILLOY FC

—increased production 14%

—increased tool life 300%

In producing the drum shaft for the winch of their famous "PIPE LAYER," Trackson Company, Milwaukee, formerly used 4¼" round bars heat treated to 269-321 Brinnel. This vital part requires considerable machining to very close tolerances. Machining difficulties and low tool life ran up the cost and slowed production.

One of our metallurgists suggested the use of Carilloy FC. It worked like a charm, gave better machinability and better mechanical properties as well. Now they turn out more and *better* drum shafts and tools last four times as long.

on heavy-duty machined parts?

Speed up output and lower your costs with

U·S·S Carilloy FC

IF you are producing heavy-duty shafting or similar parts that require considerable machining and that must have tensile strength as high as 125,000 to 175,000 lbs. per sq. in. for heavy-duty service, U·S·S Carilloy FC offers you important advantages.

Carilloy FC is a deep hardening grade of manganese-chrome-moly steel. When heat treated to meet high mechanical property requirements, it will give you machinability and surface finish that *far excel* that of other alloy steels of comparable strength and hardness.

It is this feature of Carilloy FC that makes it so desirable from a production standpoint. For by buying Carilloy FC heat treated to your strength or hardness requirements, you obtain not only excellent machinability and tool life but you *eliminate the need for heat treatment after machining.*

Used in this way, Carilloy FC speeds up production, reduces costs, saves time and keeps reject losses to a minimum by eliminating the hazards of scaling and distortion. And, most important, Carilloy FC costs only a fraction of a cent more per pound than ordinary thorough-hardening alloy steels.

U·S·S Free-Cutting Carilloy FC is available in bar form, *either* quenched and tempered or annealed, in all sizes of rounds from ⅛" to 8½" diameter.

This is not a new, untested steel. The ability of Carilloy FC to boost production and to cut costs by making it less difficult to machine steels of high strength levels has been amply demonstrated in some of the country's largest shops.

CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH
COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

CARNEGIE-ILLINOIS STEEL CORPORATION
Room 2145 Carnegie Bldg., Pittsburgh 30, Pa.

Please have a representative call to discuss U·S·S Free-Cutting Carilloy FC.

Name.....

Company.....

Address.....

City.....Zone.....State.....

UNITED STATES STEEL

What every good production man should know about—

Production advantages offered by

Magnesium Sand and Permanent Mold Castings

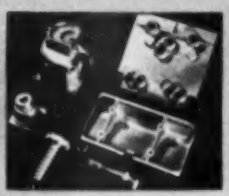
There are two major reasons why a design engineer specifies magnesium sand or permanent mold castings. The first is to improve the product. By increasing section thickness and the addition of stiffening ribs, it is possible to obtain *magnesium castings with equivalent strength, greater rigidity, and lighter weight* than can be cast with any other metal. The second reason is to utilize the *production advantages offered by magnesium.*

An outstanding characteristic of magnesium castings that makes for faster, more economical production is unexcelled machinability. A given cut can be made on a magnesium casting in approximately 50% less time than required for any other structural casting alloy. The increased machining speeds practical with magnesium castings yield sizeable reductions in production costs, particularly when extensive machining operations are required.

Magnesium is the world's lightest structural metal—a full one-third lighter than any other. This, too, cuts production costs by simplifying handling problems. Many castings that formerly required mechanical handling equipment can be moved by hand when cast in magnesium. Smaller castings are easier to move and position, reducing employee fatigue and boosting his efficiency. And in many instances, magnesium's extra lightness cuts the shipping costs of both the raw castings and the finished product.

Additional information about magnesium sand and permanent mold castings is available without obligation. Call your nearest Dow sales office or write direct.

MAGNESIUM CAN ALSO BE ECONOMICALLY FABRICATED INTO



DIE CASTINGS

Magnesium die castings possess all the usual die casting advantages plus greater lightness and excellent mechanical properties. In addition they are surprisingly economical in quantity production.

EXTRUSIONS

Magnesium can be extruded into an almost unlimited variety of shapes and sizes. By tailoring the extrusion to the job, it is often possible to eliminate costly forming and fabricating.

SHEET, STRIP AND PLATE

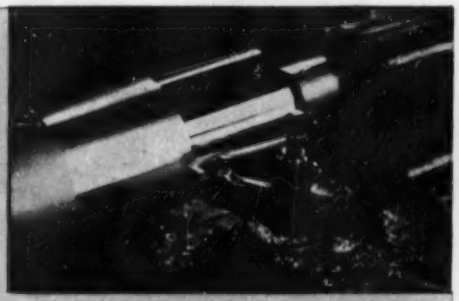
These forms have the same high strength-weight ratio possessed by other forms of magnesium. For sheet applications requiring rigidity, durability and maximum lightness, investigate magnesium.

MAGNESIUM DIVISION, DEPT. MG-41 • THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Atlanta • Cleveland • Detroit • Chicago • St. Louis
Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada

MAGNESIUM

Easiest Structural Metal to Machine



The machinability of magnesium stands head and shoulders above that of all other structural metals. Usually the maximum speeds of machine tools can be used with heavy cuts and high feed rates. That means more pieces per hour—production costs go down. Power requirements for machining magnesium are the lowest of all the structural metals.

Machining operations on magnesium produce an excellent surface finish. In most cases, the finish grinding required by other metals is not necessary for magnesium. Extremely accurate parts with dimensional tolerances of only a few ten-thousandths of an inch can be made by standard machining operations. There is no tendency for the metal to tear or drag. The free cutting action of magnesium normally produces well broken chips which do not obstruct the cutting tools or the machine.

Tool life is good. Carbon steel can be used but high speed steels give better results. Carbide tools give the best results for high production jobs.

Technical handbooks on machining magnesium are available without cost. Write direct to Midland for your copy.

Things to Remember

1. Don't run tools for full life before resharpening. Keep cutting edges sharp and tool faces polished for maximum efficiency. Honing or lapping improves tool life.
2. Tools of the same design used for cutting steel and brass may be used but best results require some modification. Relief angles should be large and tool design must make allowance for the quantity of chips produced.
3. In any machining operation clamp magnesium more frequently but less tightly than steel. This serves to avoid distortion.

JOINING

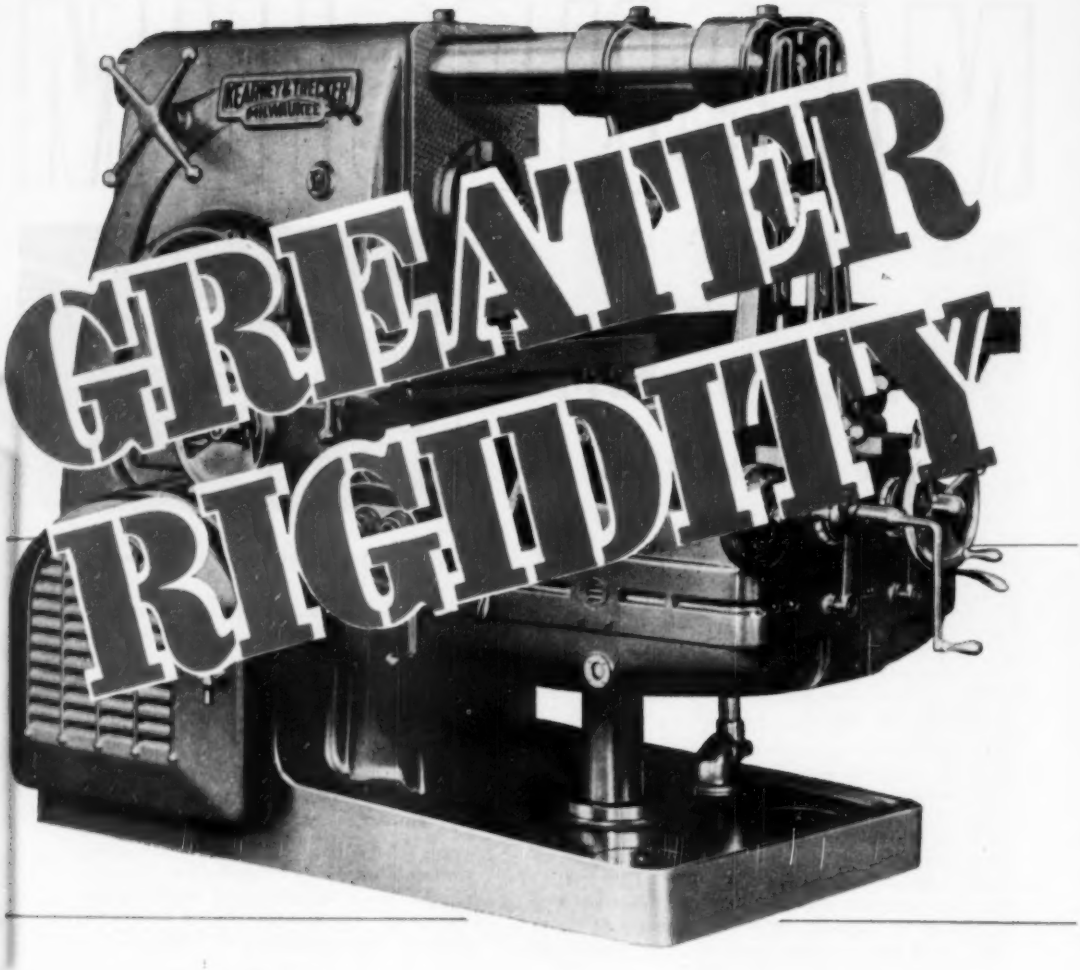
Established and well defined procedures are used in joining magnesium. All usual methods including riveting, welding and brazing techniques are in common use.

FORMING

The recognized practice of hot forming magnesium permits deep draws in one operation—eliminates repeated annealing and additional draw dies.

FINISHING

There are a wide variety of protective finishes available for magnesium. Magnesium is also adaptable to many decorative and electroplated finishes.

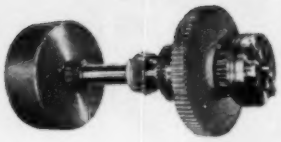


GREATER RIGIDITY

KEARNEY & TRECKER MILWAUKEE **CK's**

FROM overarms to column base, Kearney & Trecker CK milling machines are NEW! Look them over. You'll find these machines give you "more" of every desirable feature you need to make them more productive, more profitable for you. *Talk about rigidity* — these new CK columns are the most rigid milling machine columns we've ever designed! They give you 1000 pounds more of dense, high-test iron, scientifically distributed in closer heavier ribbing, in box section, sponson construction . . . to effectively absorb vibration from the heaviest cutting loads.

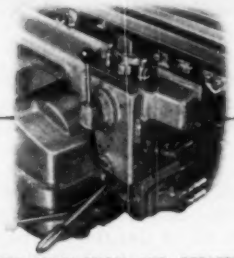
Replacement of obsolete machine tools is an



GREATER CUTTING EFFICIENCY — Added momentum of spindle-mounted flywheel assures longer cutter life and greater efficiency, through smoother, more positive drive — a key to most efficient use of modern cutting tools. Spindle rigidly supported by Kearney & Trecker's original 3-bearing design.

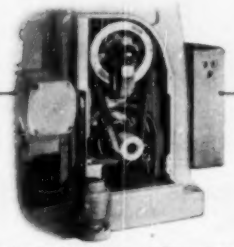
GREATER ADAPTABILITY — No. 60 Heavy Duty drive flange on Nos. 4, 5 and 6 machines enables use of heavy duty arbors with flange drive for large single or multiple cutter setups; or bolting large face-milling cutters directly to spindle nose. Average setups use standard arbors with No. 50 spindle drive.

NON-GLARE RAPID-SET DIALS — You'll avoid costly errors in reading and setting these new micrometer dials. They're vapor blasted to give you a non-glare satin surface with plenty of contrast for legibility of markings. They're easy and quick to set and provide a positive lock at every setting.

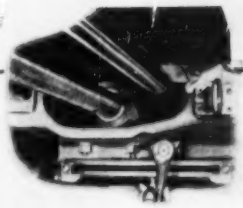


GREATER PRODUCTION AND GREATER OPERATING CONVENIENCE — Production men will like Mono-Lever Control because it reduces idle cutter time, shortens floor-to-floor cycle time. Operators will like it because it makes faster, simpler, less fatiguing work for them.

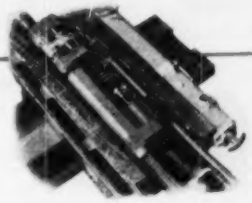
FEEDS AND SPEEDS TO TAKE FULL ADVANTAGE OF MODERN CUTTING TOOLS — and you really can do it with the broad feed and speed ranges on Kearney & Trecker's new CK milling machines. You get 24 spindle speeds (15 to 1500 rpm on Nos. 2 and 3, 13 to 1300 rpm on Nos. 4, 5 and 6) with Kearney & Trecker's automatic protecto-mesh shift to eliminate gear clashing. And there's the extra-wide feed range — 32 changes from 3/8" to 90" per minute—with separate 3 or 5 hp feed and rapid traverse drive.



GREATER HORSEPOWER — where you need it. That's what you get with new CK independent motor drives for spindle and for feed and rapid traverse. Depending on machine size (Nos. 2, 3, 4, 5 or 6), machines range from 10 to 25 hp for spindle drive and 3 to 5 hp for feed and rapid traverse.



SMOOTHER FEED PERFORMANCE — with a new design 2" diam. heavy-duty, table feed screw that affords greater bearing contact and runs through an extra-long table feed nut. These new CK machines are equipped with a backlash eliminator for more effective climb milling, more accuracy and longer screw life.



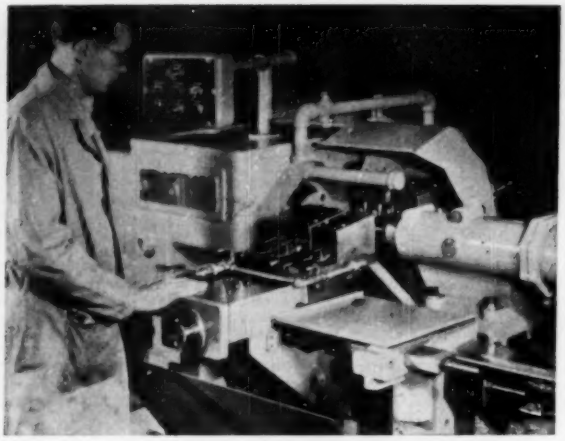
GREATER MACHINE LIFE — through automatic lubrication and generously proportioned gears and shafts throughout for overload conditions. There's a forced flood system in the column and knee, and a positive metered, pressure pump system for table, saddle and knee ways, and table feed assembly.

Kearney & Trecker's new CK Line is designed to meet every demand of present-day milling operations . . . making CK machines more accurate, and MORE PRODUCTIVE for you. Contact your nearest Kearney & Trecker representative or write direct to obtain complete specifications of these fine new machines. See how they easily replace obsolete machines at substantial savings to you. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

investment that makes both Dollars and Sense.

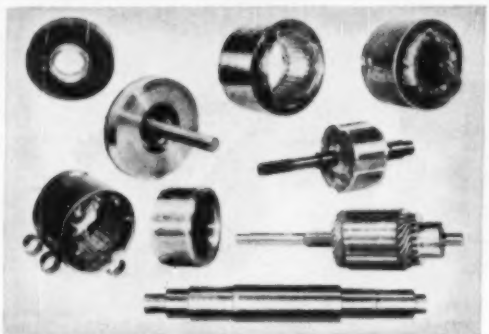
Typical Turning Jobs On SUNDSTRAND Automatic Lathes

Save Time and Money With Multiple Tooling and Automatic Cycling



These six turning jobs illustrate the versatility of Sundstrand Automatic Lathes. Actually, it makes little or no difference whether your turning problem is a mass production job running into thousands of pieces . . . a short run of a few pieces . . . or a special turning job, our engineers can show you how to do it *better* and *faster* on Sundstrand Automatic Lathes with quick cycle changeover. *And*, you'll get all of the time-saving advantages of multiple tooling and automatic cycling on practically any turning job.

Before you buy *any* turning equipment, investigate Sundstrand Automatic Lathes.



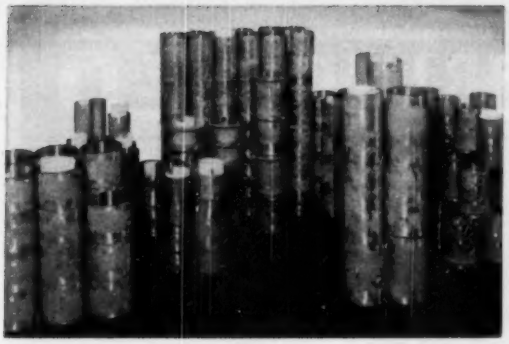
Turning Various Electric Motor Parts

Parts include motor frames, commutator assemblies, armature assemblies, rotors, shafts etc. Operations are varied including turning of shafts, rabbet fits, and turning, facing and shaving armature assemblies. Parts are machined in both long and short runs. If you make motors, write for more detailed information.

Turning Different Types and Sizes of Pistons

These pistons range from small compressor types to large Diesel engine pistons. Materials are cast iron, steel and aluminum. Operations include turning, grooving, facing, boring, centering, milling skirt, slitting and an inspection cut after moulding. If you manufacture pistons, take advantage of the experience of our engineers . . . both on turning and milling operation.

RIGIDMILS • FLUID SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

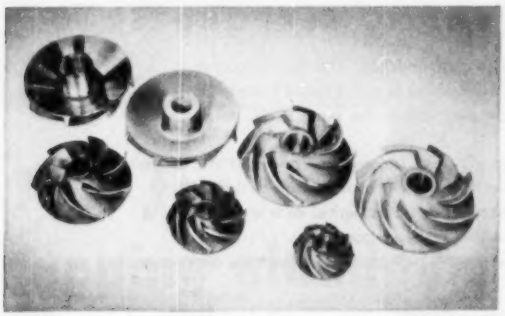


Turning and Boring 1000 Different Bushings

These bronze bushings come in diameters from 2⅜ to 8 inches, lengths from 2 to 10 inches. Operations include rough and finish turning the outside diameter, rough and finish boring inside diameter and facing one or both ends. *In spite of short runs (from 4 to 200) one Sundstrand replaced two other machines and doubled production.*

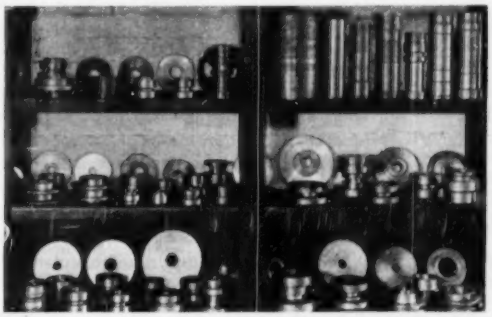
Turning Miscellaneous Gear Blanks

This machine manufacturer processes some 250 gear blanks of many types and sizes. Lot sizes are low yet a Sundstrand Automatic Lathe reduced turning time 40% over the former method. Machine used is equipped with overhead tool slide to facilitate wide range of tooling set-ups and to improve production.



Saving 13 Hours On Turning Each Lot of 20 Impellers

Parts are bronze, range in size fron 4" to 10" in diameter. Parts were formerly machined in three operations and three set-ups in 15 hours. Same amount of machining is done in *two set-ups* on Sundstrand in 2 hours. Turning convex and concave shapes and boring center hole comprise operations.



Turning Various Parts In Short Runs

This manufacturer uses 2 Sundstrand Automatic Lathes to turn parts represented by master samples shown above. Lot sizes vary from 30 to 200 and savings are tremendous. The complete story is included in the book offered at left. Write for your copy.

FREE
Additional Data

on many jobs similar to those described above are included in this helpful book. Write for your copy today. Ask for book No. 197

SUNDSTRAND
MACHINE TOOL COMPANY
2533 Eleventh St. • Rockford, Ill., U.S.A.

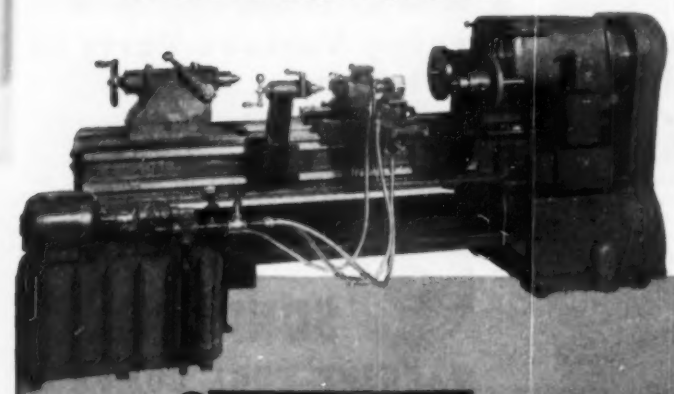
DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

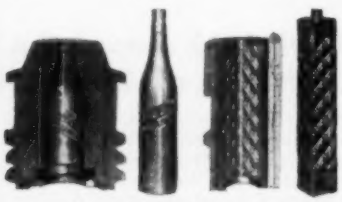
WITH SPRINGFIELD HYDRAULIC REPRODUCER

Now you can secure accurate three dimensional contour reproductions with the completely hydraulic, super-sensitive Springfield Reproducer on Springfield Geared Head Lathes. Reproduces internal, external, and face contours using a master, a template or the piece itself. Holds reproduction to extreme limits of accuracy.

Its usefulness and versatility are remarkable—it will trace a compound curve, follow the flats of a square milk bottle, profile and write simultaneously, bring out every detail of the most intricate design, turn a straight, smooth taper on a bar, cut a perfect spiral or a large cam and perform many similar money-saving, time-saving jobs that come up constantly.

Write today for catalog and complete information. We will gladly demonstrate on your work to show what the Springfield Reproducer will do.





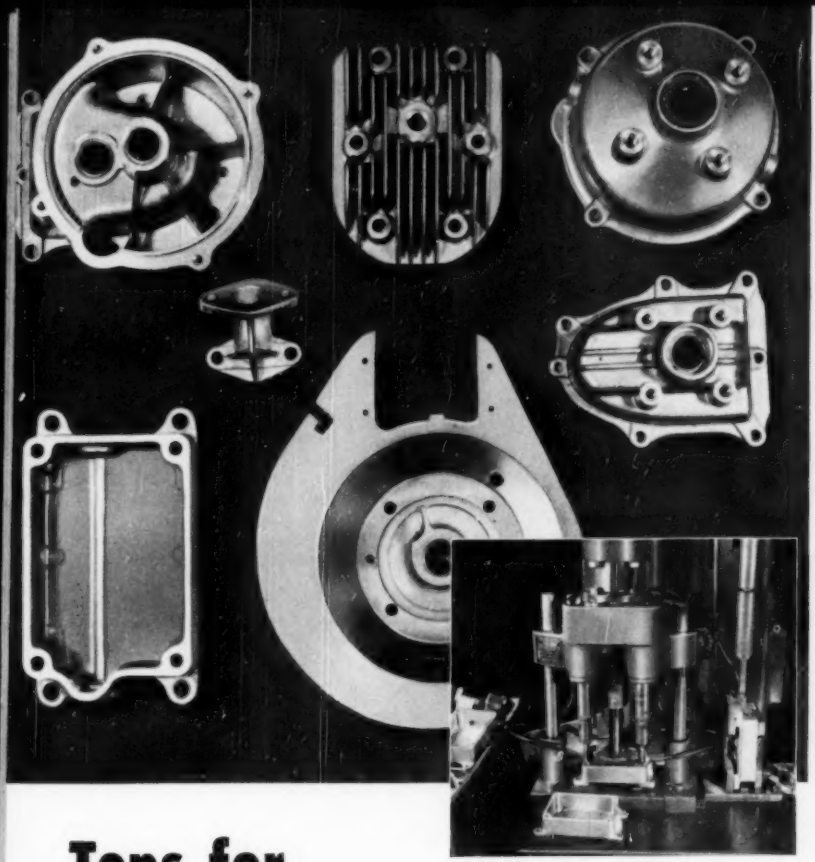
Just two examples from many of the accurate reproductions from Springfield Reproducers. Letters and figures reproduced from the master; intricate designs reproduced on flat surfaces.

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

Exclusive Representatives in All Principal Cities



Tops for tapping aluminum . . .

FOR DRILLING and tapping operations on aluminum castings, a large midwest manufacturer wanted a cutting oil of light color and low viscosity that would give maximum tool life.

After testing various products, officials found the cutting fluid that fully met their specifications. It was STANICUT 62 FC Cutting Oil recommended for the job by a Standard Oil cutting oil specialist. It was tried in four machines.

A week's run convinced the plant superintendent and the machine operators that STANICUT 62 FC was the cutting oil for the job. *Tool life was double their expectations. Threads cut were smooth and clean. Washability was excellent; oil carry-away was negligible.*

The experience of this company indicates the savings you can make with STANICUT Cutting Oils, not only on aluminum jobs but on a wide variety of operations. You can profit further through the engineering service of a Standard Oil lubrication specialist. He is located within easy reach of your plant. How you can benefit by his on-the-spot service is explained at the right. Standard Oil Company (Ind.), 910 S. Michigan Ave., Chicago 80, Ill.

STANICUT 62 FC
TRADE MARK
Cutting Oil

What's YOUR problem?

W. J. Mockle, lubrication specialist at Standard Oil's Detroit office, helped this company solve a problem by recommending the product that exactly met the requirements of a special job.

He is one of a corps of Standard Oil lubrication specialists located throughout the Midwest to provide "on-the-spot" service to plant operators. One of these lubrication specialists is near your plant. He has plenty of practical experience and has been specially trained for his job in a Standard Oil Lubrication Engineering School. You can obtain his services quickly and easily. Just phone or drop a card, today, to the nearest Standard Oil Company (Indiana) office. When he calls on you, discuss with him the advantages of such outstanding products as:

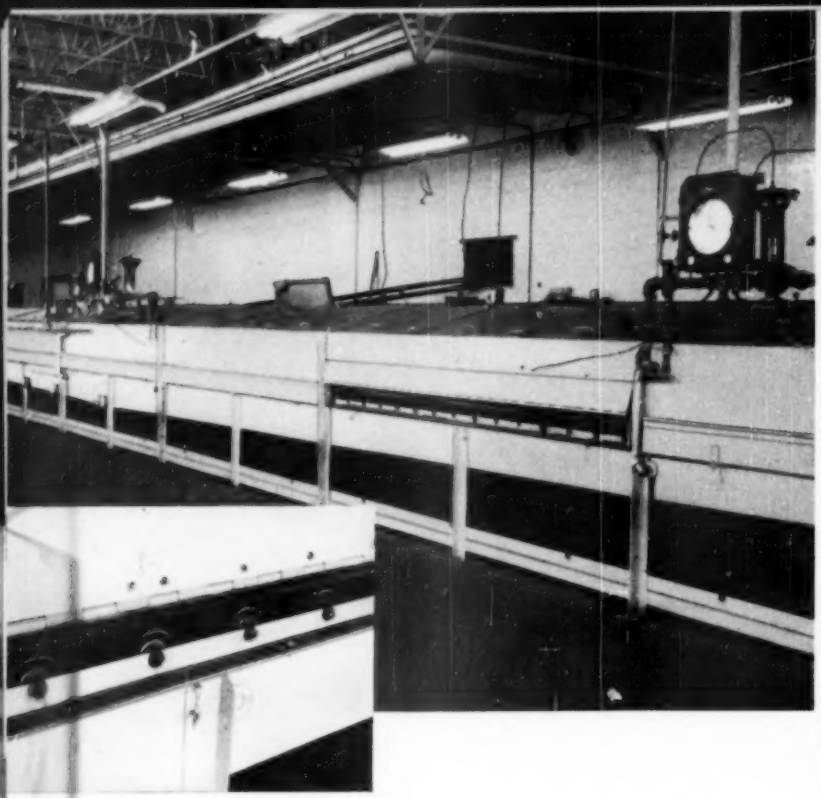
STANICOOL HD Soluble Oil – Because they contain additional compounding, these heavy-duty soluble oils possess not only the cooling ability of an emulsion but also the ability to give better tool life and finer finishes than can be obtained with a conventional soluble oil.

STANOSTAMP Compounds – Here are three established products for stamping or heavy drawing operations of either low-carbon or alloy steels. Water can be added to these paste compounds to provide the most economical applications. STANOSTAMPS offer maximum protection for dies and work. These compounds can be readily removed in conventional washing equipment.

EUREKA Tempering Oil – From Standard Oil's complete line of quenching and tempering oils, this product is recommended for continuous use in tempering-oil baths at temperatures up to 525°F.

STANDARD OIL COMPANY (INDIANA)

STANDARD



Bearings lubricated not once a day but once in two weeks

CONVEYOR ROLLS on the pasteurizer (above) are continually subjected to water spray at temperatures ranging from 60° F. to 212° F. Under such conditions it is usually extremely difficult to lubricate the roll bearings.

When this unit was installed, it was expected that rolls would have to be lubricated daily—a large order on a conveyor 80 feet long with rolls spaced 6 inches apart. However, a Standard Oil lubrication specialist was asked for his recommendation. He selected STANOLITH Grease—a lithium-soap product with the ability to withstand both heat and water.

The conveyor, now operating on STANOLITH, is lubricated—not daily—but *once every two weeks*. STANOLITH provides good lubrication at both high and low temperatures in the machine and is not washed away by the spray.

Lubrication problems caused by heat, water, or low temperatures in your plant can be solved by this one lubricant: STANOLITH Grease. Through its remarkable versatility, you can avoid the cost and trouble of stocking and using a variety of special greases. A Standard Oil Lubrication Engineer will help you make these savings. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANOLITH
TRADE MARK
Greases

What's YOUR problem?

Mr. J. D. Clark of Standard Oil's Saginaw, Michigan, office is the lubrication specialist who helped this customer make a worthwhile saving by recommending STANOLITH Grease.

Standard's lubrication specialists are located throughout the Midwest. One of them is within easy reach of your plant. He offers you an on-the-spot lubrication service that's backed by extensive experience and training in the use of modern lubricants and fuels. He can help you make important reductions in operating and maintenance costs.

Arrange, today, for a visit of this lubrication specialist by phoning or writing the nearest Standard Oil Company (Indiana) office. Ask him to give you actual performance data on these outstanding products:

STANOIL Industrial Oils—This multi-purpose line of oils provides cleaner operation of hydraulic units, supplies effective lubrication in compressors, gear cases, and circulating systems. One or two grades can replace a wide variety of special oils and lubricants.

SUPERLA Greases—Available in a wide range of consistency grades and in both lime-soap and soda-soap types, SUPERLA Greases cover a wide range of operations. These efficient products are comparable in quality with the highest type of special greases.

CALUMET Viscous Lubricants—On open gears and wire rope, these greases strongly resist washing and throw-off. Their superior wetting ability affords better coating of gears, better internal lubrication of wire rope.

STANORUST Rust Preventives—The eight grades of STANORUSTS form one of the most complete and effective lines of rust preventives on the market today. Each has been scientifically and specifically developed for its intended use. The grades range from a fingerprint remover to a heavy petrolatum that protects against corrosion for years under the most severe outdoor exposure.

STANDARD

STANDARD OIL COMPANY (INDIANA)

"no more GAMBLING on tool steel selection"

[⅓ actual size; Selector is in 3 colors]

Here's how it works:

To use the Selector, all you need know is the characteristics that come with the job: type and condition of material to be worked, the number of pieces to be produced, the method of working, and the condition of the equipment to be used.

FOUR STEPS—and you've got the right answer!

1. Move arrow to major class covering application
2. Select sub-group which best fits application
3. Note major tool characteristics (under arrow) and other characteristics in cut-outs for each grade in sub-group
4. Select tool steel indicated

That's all there is to it!

Here's an example:

Application—Deep drawing die for steel

Major Class—Metal Forming—Cold

Sub-Group—Special Purpose

Tool Characteristics—Wear Resistance

Tool Steel—Airdi 150

One turn of the dial does it!

And you're sure you're right!!

Since the first announcement, hundreds of tool steel users have received their CRUCIBLE TOOL STEEL SELECTORS. The comments received indicate that this handy method of *picking the right tool steel right from the start* is going over big.

"Handiest selector I've ever seen"

"No more gambling on tool steel selection"

"You're right, the application should dictate the choice of the tool steel" . . . and many, many more favorable comments.

You'll want your CRUCIBLE TOOL STEEL SELECTOR. It uses the only logical method of tool steel selection—begin with the application to pick the right steel! And the answer you get with one turn of the Selector dial will prove satisfactory in every case, for the CRUCIBLE TOOL STEEL SELECTOR covers 22 tool steels which fit 98% of all Tool Steel applications. ALL the tool steels on the Selector are in Warehouse Stock . . . that means when you get the answer, you can get the steel . . . fast!

Write for your Selector today! We want you to have it, because we know you've never seen anything that approaches your tool steel problems so simply and logically. Just fill out the coupon and mail. Act now! CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.

Crucible Steel Company of America
Dept. A, Chrysler Building
New York 17, N. Y.

Gentlemen:

Sure! I want my CRUCIBLE TOOL STEEL SELECTOR!

Name _____ Title _____

Company _____

Street _____

City _____ State _____

CRUCIBLE first name in special purpose steels

TOOL STEELS

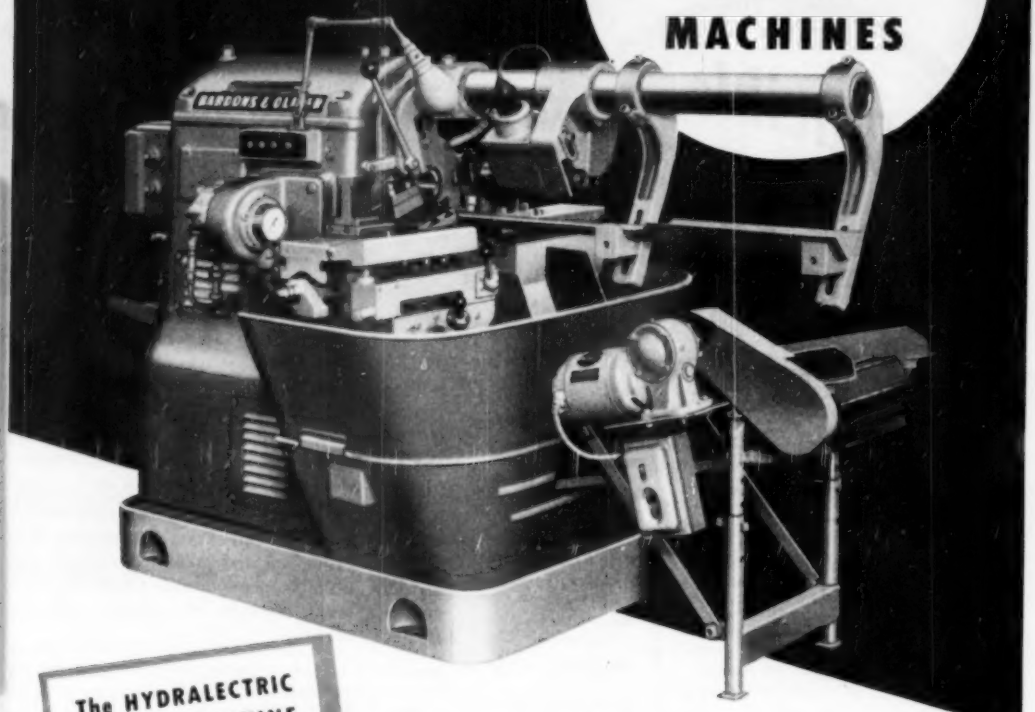
fifty years of Fine *steelmaking*

Branch Offices and Warehouses: ATLANTA • BALTIMORE • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DENVER • DETROIT HOUSTON, TEXAS • INDIANAPOLIS • LOS ANGELES • MILWAUKEE • NEWARK • NEW HAVEN • NEW YORK • PHILADELPHIA • PITTSBURGH • PROVIDENCE ROCKFORD • SAN FRANCISCO • SEATTLE • SPRINGFIELD, MASS. • ST. LOUIS • SYRACUSE • TORONTO, ONT. • WASHINGTON, D. C.

Motor Driven Chip Conveyor

INCREASES PRODUCTION ON..

BARDONS & OLIVER HYDRALECTRIC CUT-OFF MACHINES



The HYDRALECTRIC CUT-OFF MACHINE is built in four sizes:

No. 33. Capacity 3"
No. 34. Capacity 4"
No. 35. Capacity 5½"
No. 36. Capacity 6⅝"

Outstanding Features:-

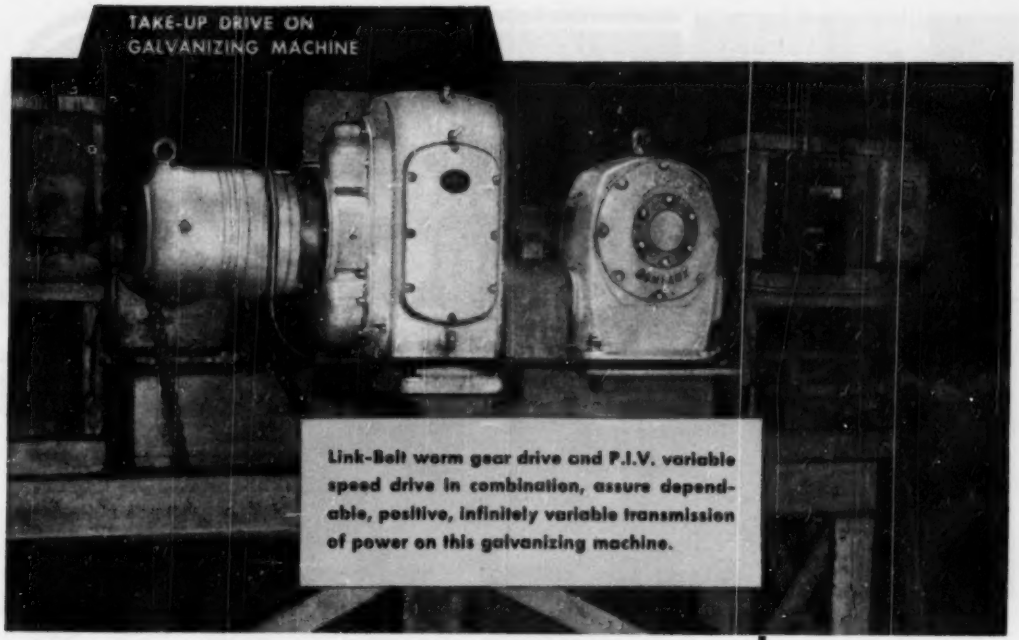
1. No down time or production loss for cleaning out chips or butt ends. The conveyor drops them in a tote pan.
2. By means of a trough the work is automatically separated from the chips.
3. Time saved makes it easy for the operator to attend two or more machines. They are fully automatic.

Please write to us for further information.

WE ALSO BUILD A COMPLETE LINE OF RAM AND SADDLE TYPE TURRET LATHES

BARDONS & OLIVER, INC.

1133 WEST 9TH STREET • CLEVELAND 13, OHIO



Link-Belt worm gear drive and P.I.V. variable speed drive in combination, assure dependable, positive, infinitely variable transmission of power on this galvanizing machine.

Look to LINK-BELT for 3 ways to solve your speed reduction problems

There are various considerations in the selection of proper units for speed reduction. Is it ratio? Is it space? Is it shaft position? Is it shock loads?

Whatever it is—LINK-BELT'S complete line of enclosed gear drives gives you the exact answer to your needs.

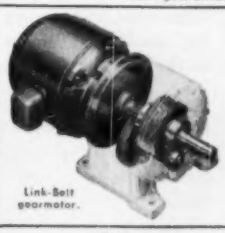
Our engineers advise you without being limited to an incomplete line. Their advice is yours without obligation.

Ask for Books 2247, 1819, 1824 for the complete answer to your speed reduction problems.

11,500

LINK-BELT enclosed gear drives

Link-Belt worm gear drive.

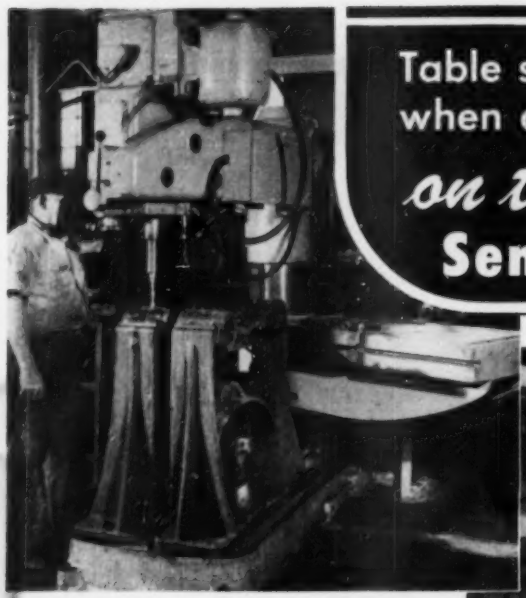


Link-Belt gearmotor.

Link-Belt herringbone gear drive.

LINK-BELT COMPANY Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Johannesburg. Offices, Factory Branch Stores and Distributors in Principal Cities.

Table swings out of the way when a big job comes along *on the* FOSDICK Sensitive RADIAL



Photos courtesy Edward Renneberg Sons plant, Baltimore, Md.

● This installation definitely illustrates the advantage of the swinging action of the adjustable table on the Fosdick Sensitive Radial. Table and arm both swing in an arc of 360°.

Also note that two castings are mounted on the conventional Radial Drill base in such a position that holes can easily be drilled in all four bearing caps by merely moving arm and head to desired position.

This also demonstrates the advantage of a high speed sensitive drill built along the lines of a radial drill and reveals new cost saving methods of drilling small holes in a wide variety of work.

If you are interested in a sturdy, sensitive drill that combines all the advantages of radial flexibility you should investigate the new Fosdick Sensitive Radial.

For full particulars write for the Fosdick Sensitive Radial Bulletin S R A.

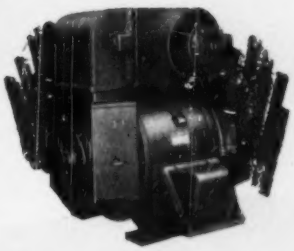
FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

save installation cost

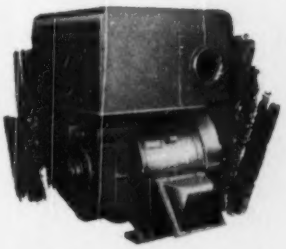
G-E unit-cooled motors keep on the job on this diesel-engine cylinder-boring machine.

unit-cooled
D-C MOTORS

2 types to meet your needs



SINGLE-BLOWER TYPE—
for normal speeds has shaft-driven fan to circulate internal air, and separate motor-driven blower for external air.



DOUBLE-BLOWER TYPE—
can be operated continuously at very low speeds without harmful overheating. Auxiliary induction motor drives blowers for internal and external air.

Here's Protected Power For Harmful Atmospheres . . . Unit-Cooled D-C Motors From 15 to 200 Hp

G-E unit-cooled motors eliminate need for pipes, ducts, or external cooling systems.

Easy maintenance! Special heat-exchanger and ventilating system keep airborne particles out of the motor. Large end-shield openings provide easy access to commutator brushes and brush rigging.

Flexibility! You can interchange these motors easily with G-E open motors, because they have the same mounting dimensions.

You can buy G-E unit-cooled motors from 15 to 200 hp, for constant or adjustable speed. Ask your G-E representative or write for Bulletin GEA-4469. Apparatus Department, General Electric Company, Schenectady 5, New York.

GENERAL ELECTRIC

733-20

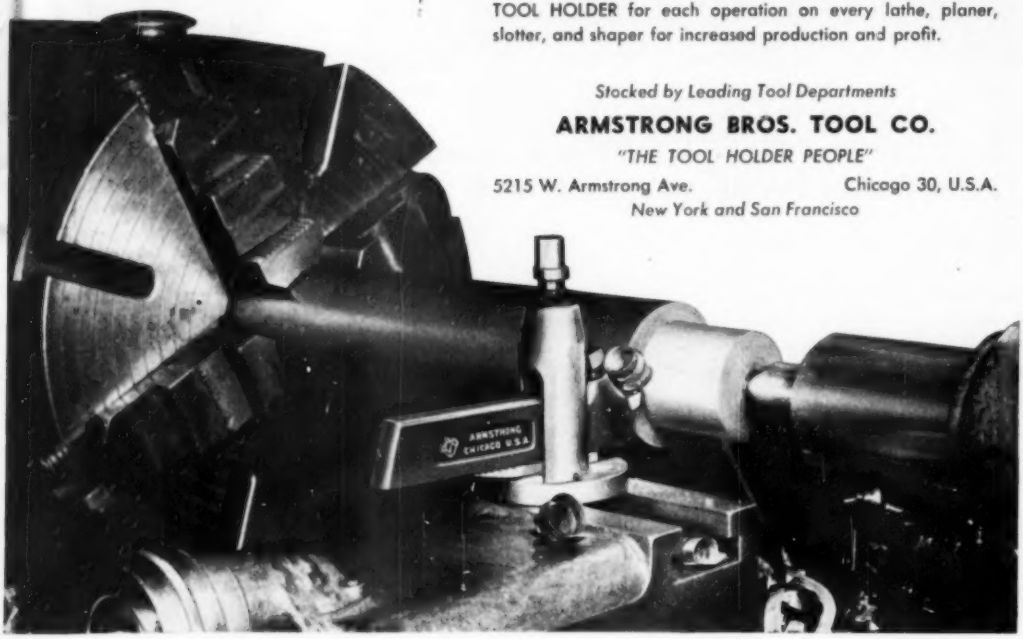
ARMSTRONG

Profit two ways with ARMSTRONG TOOL HOLDERS reduce cost—increase output

ARMSTRONG TOOL HOLDERS are *profitable* because they reduce overhead by saving while increasing output.

- Embodying the Armstrong Principle of an inserted cutter in a permanent drop forged shank or tool holder, they "Save: All Forging, 70% Grinding and 90% High Speed Steel."
- They save machine hours and man hours by permitting higher speeds and heavier feeds.
- They end costly delays for tooling up.
- They increase machining efficiency, for each has been carefully designed, is die perfect in form, is correct in cutting angle, in tool approach and clearance.
- They end tool breakage—have a wide safety factor of strength beyond need.

They reduce tool cost . . . each does the work of a complete set of forged tools and can be bought as needed from your local Industrial Distributor at prices so reasonable that no one can afford to make his own tools. Use the correct ARMSTRONG TOOL HOLDER for each operation on every lathe, planer, slotter, and shaper for increased production and profit.



Stocked by Leading Tool Departments

ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

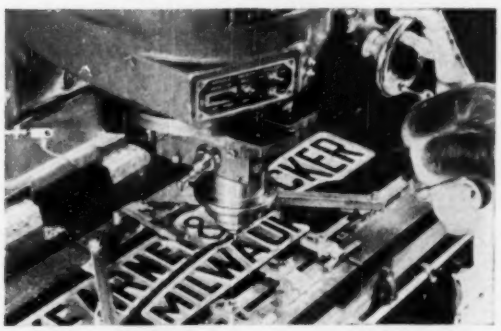
5215 W. Armstrong Ave. Chicago 30, U.S.A.

New York and San Francisco

Here's How to Make a Name for Yourself —in 55 Hours!

1 **FAST!** Here's 2 metal pattern jobs that ordinary methods take lots of time and effort to produce. Using a Rotary Head Milling Machine, they were simplicity itself. Operator accurately located each workpiece and one working center. The rest was simply following blueprints and simple arithmetic.

2 **DIRECT!** Regardless of jobs — pattern molds, tools, dies, hobs, cavity molds or production parts, the Rotary head milling machine transmits the blueprint dimension direct to the workpiece. No fussing with templets or models. Operator relies on simple, precise control of cutter and table movements.



3 **ACCURATE!** Machine features precision control of all cutter movements in any plane — enables operator to accurately locate and generate complex angles and contours. It reduces chance for error, because most jobs, even if somewhat large or complex can be completed in one or two set-ups.

4 The Kearney & Trecker-Milwaukee Rotary Head Milling Machine offers a conservatively estimated 35% savings in use on a major percentage of tool, die, mold, or production work within working range. For complete data write for bulletin 1002C

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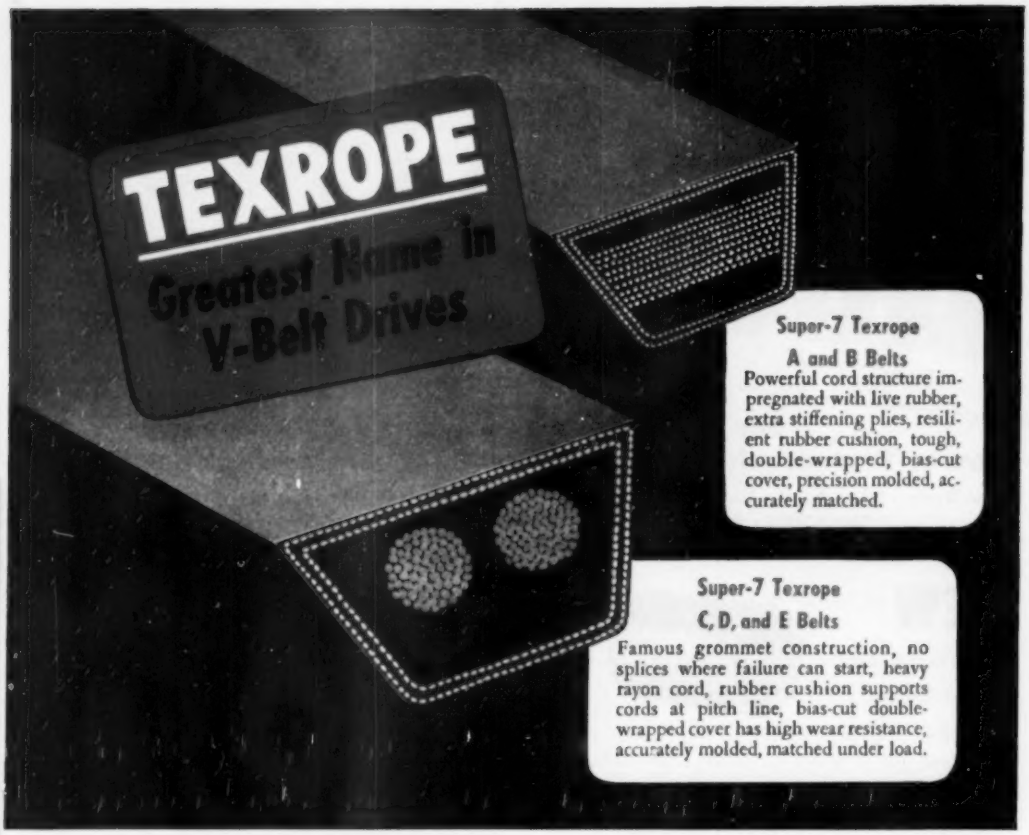
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. . . for stock removal

These side plates, approximately 9″ x 18″, are ground from the rough on a No. 18 Blanchard with 36″ chuck — requiring 1/16″ to 1/8″ stock removal per side.

. . . for close tolerance

These plates are held flat within .003″, parallel to .001″, and to a dimension tolerance of ±.001″. A Blanchard 20C50 Cylindrical Wheel is used.

. . . for speed

Three chuck loads of 5 pieces each, give a production of 30 surfaces per hour. Feed is .020″ per min.

. . . for comparison

A comparison of the Blanchard Method with your present methods may be a pleasant surprise. May we grind some samples for you?

V-348

NO. 18 BLANCHARD SURFACE GRINDER

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PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY
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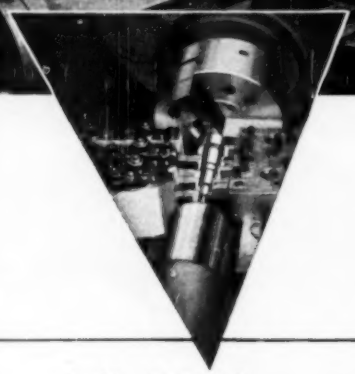
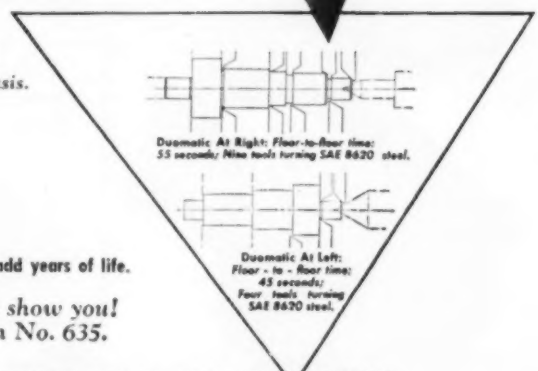
ONE MAN OPERATES 2 DUOMATICS



LODGE & SHIPLEY Duomatic productivity is illustrated in this typical automotive set-up. The operator starts the first Duomatic on its cycle. While this machine operates automatically, the same operator easily handles a cycle on the other Duomatic. Production *flows* from both 2A Duomatics!

The low-cost, precision production of Lodge & Shipley 2A Duomatics is a valuable weapon in the fight against mounting costs. Are *your* lathes operating profitably? Lathes only a few years old may be badly outmoded when compared with new Duomatics *on a productive basis.*

- ★ **Turn and bore with front and rear tool slides.**
- ★ **Swivel tool slides for angular facing and turning.**
- ★ **Simplicity of set-up reduces set-up time.**
- ★ **NO CAMS REQUIRED for automatic cycle.**
- ★ **Ideal for long or short runs.**
- ★ **Easily handled by unskilled operator.**
- ★ **New hardened steel bedways and cross slide ways—add years of life.**


Duomatic At Right: Floor-to-floor time: 55 seconds; Nine tools turning SAE 8620 steel.
Duomatic At Left: Floor - to - floor time: 45 seconds; Four tools turning SAE 8620 steel.

Let a Lodge & Shipley Representative show you!
Write for 2A Duomatic Bulletin No. 635.

THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
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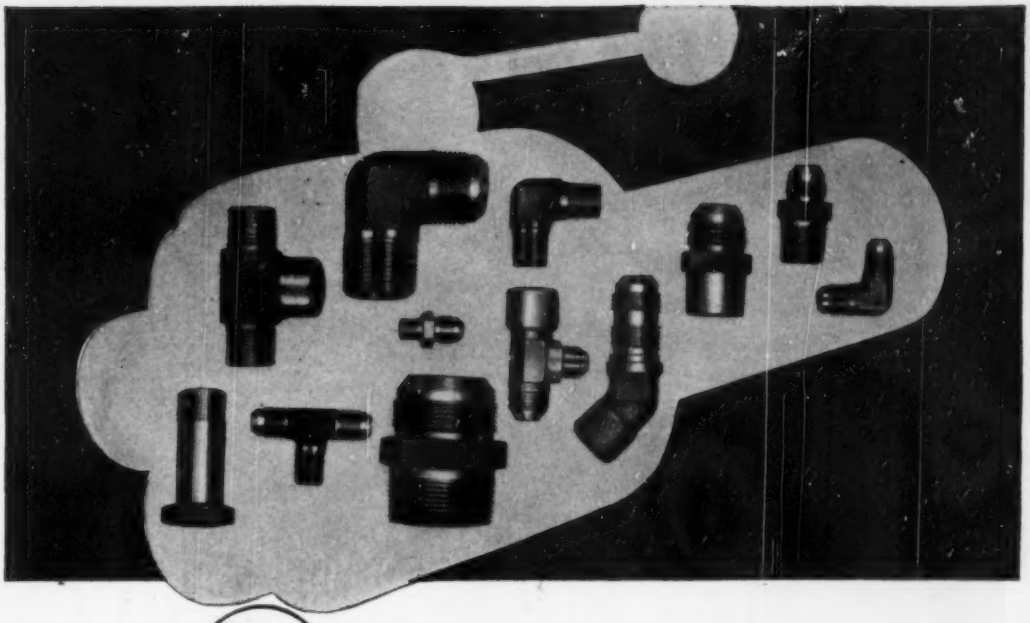
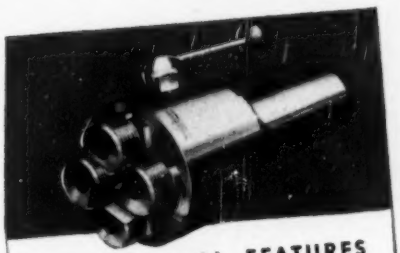


VERS-O-TOOL—THE STANDARD

at The Parker Appliance Co.— FOR THIS CLASS OF WORK



VERS-O-TOOL FEATURES

1. Circular chasers are always up to correct position — assuring precision threads and smooth finish.
2. Accuracy of thread form is assured throughout the life of a circular chaser, by means of direct micrometer check after each regrind.
3. Vers-O-Tool circular chasers are regrindable through a full 270°—an exclusive feature, for longer life.
4. Circular ground thread chasers are available in a full range of thread sizes—even down to 260 TPI.

You can't afford to take chances on aircraft tube fittings. That's why a Class 3 Fit is required on all straight threads for Parker AN Fittings. Similarly, all taper threads must be basic-checked with ring, profile and tri-roll gauges—*and all threads must have extra-smooth finishes.*

And that's why you'll find Vers-O-Tools used as the standard for production at Parker. They've found, through carefully-checked records, that no other die-heads can deliver the same exacting high quality on long, tight-schedule production runs.

There are other reasons, too: lower chaser costs, less tool inventory, faster machining time—all these tip the scales to Vers-O-Tools. For complete details on how they can improve quality and cut costs in your shop, ask for catalog D-49.

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Centralized controls; instant selection of speeds with unique direct-reading "color-match" dial; dual control levers, easy-to-read thread chasing dial; graduated tailstock barrel; "Tray-Tops" for convenient parking of tools, etc.

DURABLE

Anti-friction and oilite bearings, amply lubricated; integrally splined shafts and spindle of hardened alloy steel; Flamatic hardened gears in headstock, apron, and quick-change gear box; ground bedways, hardened if you specify.

SPACE SAVING

With two cabinet legs and "Tray-Tops" for parking tools, the ordinary storage cabinet becomes unnecessary.

SAFE

Control levers and snap levers disengage if something accidentally falls on them; long taper key drive spindle (chucks and face plates cannot spin off); electrical equipment fully enclosed; "Tray-Tops" keep wrenches, tools, gages off carriage wings and ways; cabinet legs store chucks and face plates away from operator's feet.

LOW COST

Tray-Tops are truly economical. For example, the 15" x 42" Toolroom Model, with taper attachment, flame hardened ways, two chucks, and regular equipment including 2 hp motor sells for only $2913.28, f.o.b. Cincinnati.

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. . . and because of their low first cost they do not "eat their heads off" in carrying charges the rest of the time. Size up all the economy-priced lathes and you'll agree that Tray-Tops deliver more work per dollar invested than any other lathes in their class. Make Tray-Top your **next buy** because it's your **best buy!**

CINCINNATI LATHE & TOOL CO.

Cincinnati 9, Ohio, U. S. A.

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LOW OPERATING COSTS AND DEPENDABLE
DAY IN AND DAY OUT PERFORMANCE,
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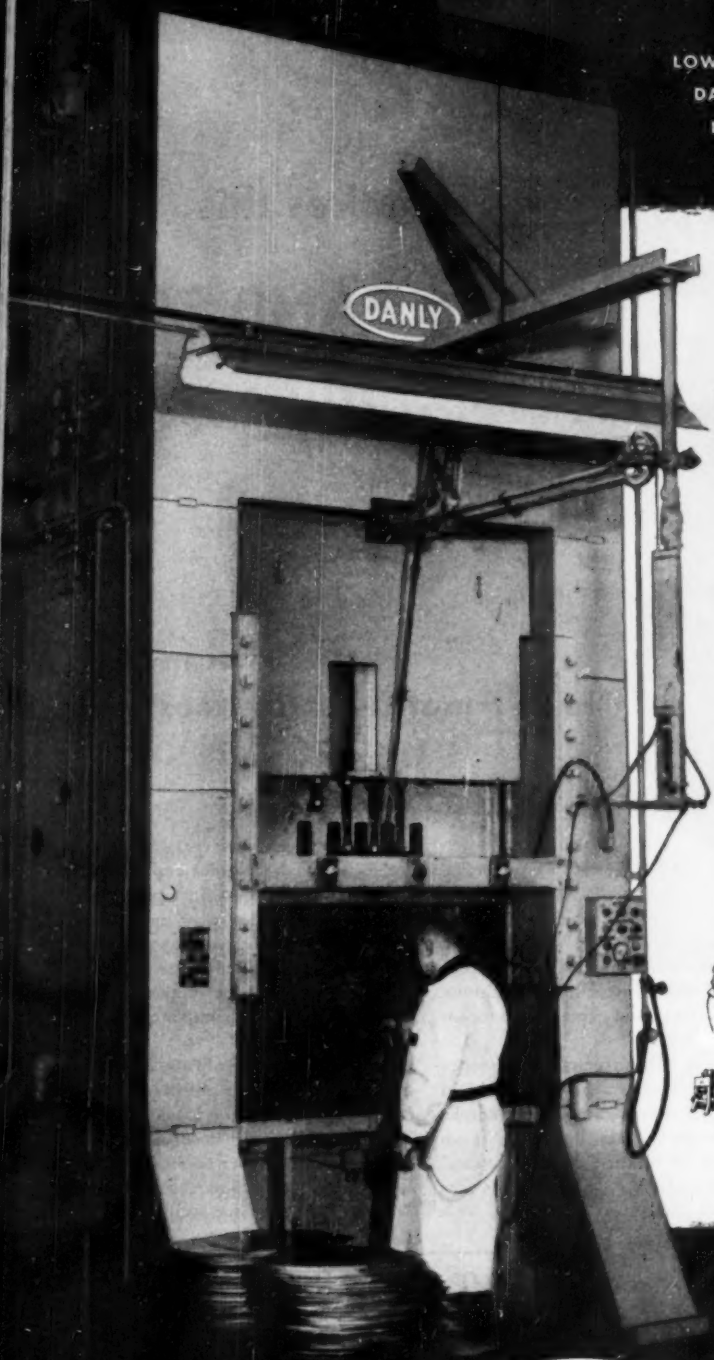

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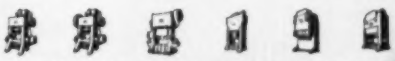
Send for this new Danly Straight Side Press Catalog

*The 175 ton straight side DANLY press shown is located in the new A. B. Dick plant, manufacturers of mimeograph office equipment.



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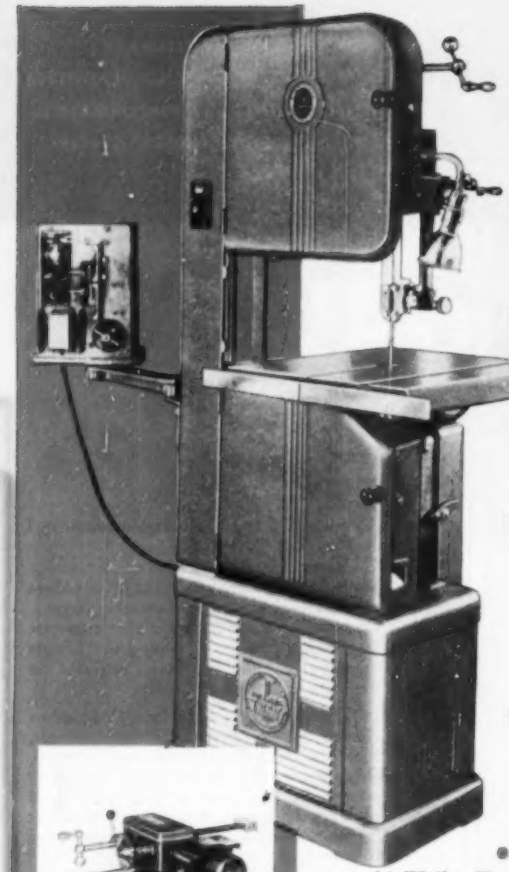
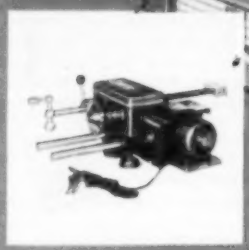


Walker-Turner *design* makes this *new* 16" BAND SAW a *cost-cutting* machine!

. . . designed to cut metal-cutting costs.



NEW POWER FEED protects blade against distortion. Motor-driven, it maintains a pre-set feeding pressure. Easily adjusted for blade condition and various types of material.

walker-turner

● You would expect this Walker-Turner machine to be efficient. But you'd have to *operate it,* in your own plant, to appreciate how quickly, accurately and economically this new 16" Band Saw cuts sheets, rods and tubes of steel, iron, aluminum, brass, alloys and compositions, or molded plastics.

Secret of its high operating efficiency is Walker-Turner *unit design.* Main column of the machine, for example, supports the two cast iron wheel housings, which in turn carry the wheel bearings and other elements of the saw.

Wheel housings are fitted with strong, lightweight covers that completely shield saw blades and wheels. Design improvements in upper and lower blade guides give maximum support to both wide and narrow saw blades. Easily adjusted roller provides back support on the upper guide. Every basic part is completely functional!

Find out more about Walker-Turner designing . . . how it can help you to increase production and lower machining costs. See your local authorized Walker-Turner dealer or mail coupon for catalog describing the complete Walker-Turner money-saving line.

Walker-Turner Division, Kearney & Trecker Corp.
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Please send me a copy of the new Walker-Turner Catalog.

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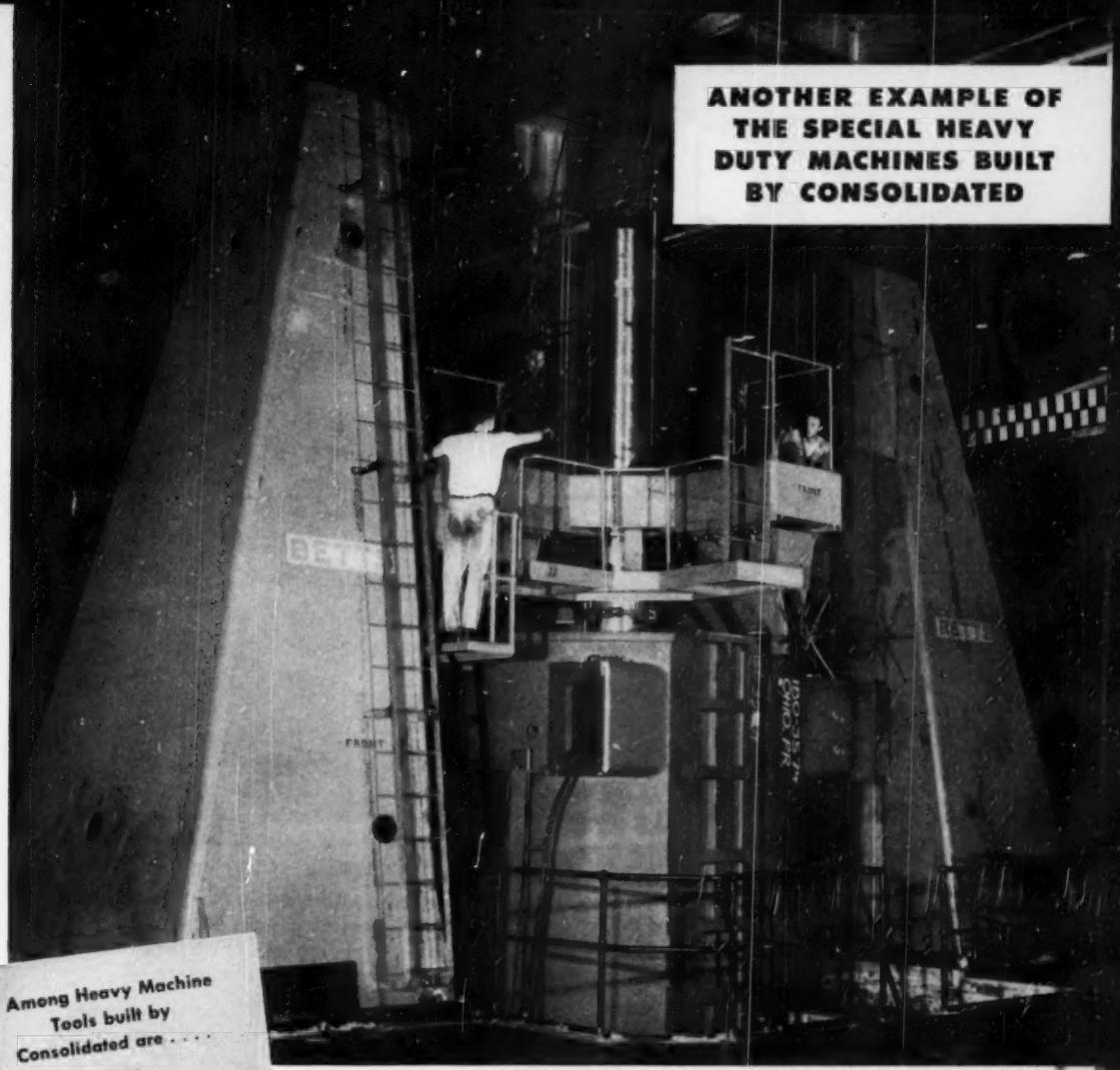
ANOTHER EXAMPLE OF THE SPECIAL HEAVY DUTY MACHINES BUILT BY CONSOLIDATED



BETTS SPECIAL VERTICAL BORING AND FACING MACHINE

Built for one of the larger electrical companies and used for boring and facing heavy welded steel generator stator frames from a vertical position, this unusual machine eliminates the inaccuracies heretofore present in such operation performed horizontally and, at the same time, reduces boring time by approximately two-thirds. It may also be used for drilling rib sections and milling spring assemblies. This machine is 36'-6" high, 13'-0" of which is below the floor level. Weight approximately 190,000 pounds. The boring bar is 22" in diameter and 36'-0" long.

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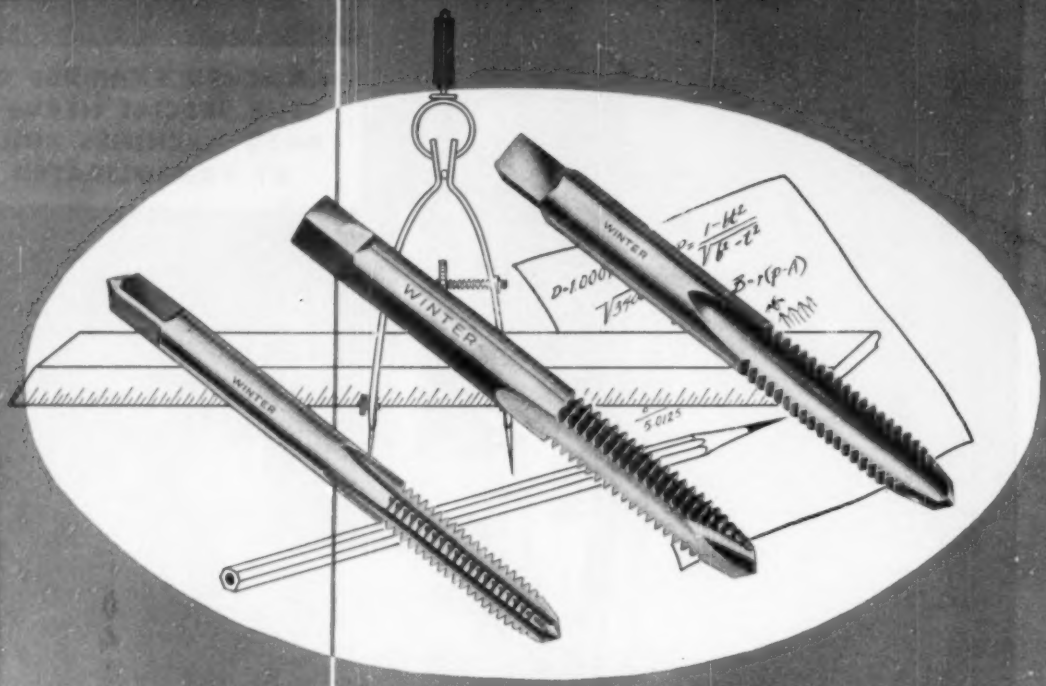


TAPPING SMALL HOLES with WINTER MACHINE SCREW TAPS

Satisfactory tapping of small diameter holes is always a difficult job, because of the inherent frailty of the taps that must be used. Proper tapping machines and well designed, precision built taps will materially improve results on this type of tapping operation.

Users are surprised and pleased at the way Winter "Balanced Action" Machine Screw Taps measure up to these exacting specifications. These taps are designed and built to the most rigid specifications for accuracy, symmetry, and sturdiness.

Other Winter Taps are: Precision Ground, Commercial Ground, and Cut Thread Taps, in all stock styles and sizes, and special taps to your specifications.

ALWAYS AT YOUR SERVICE

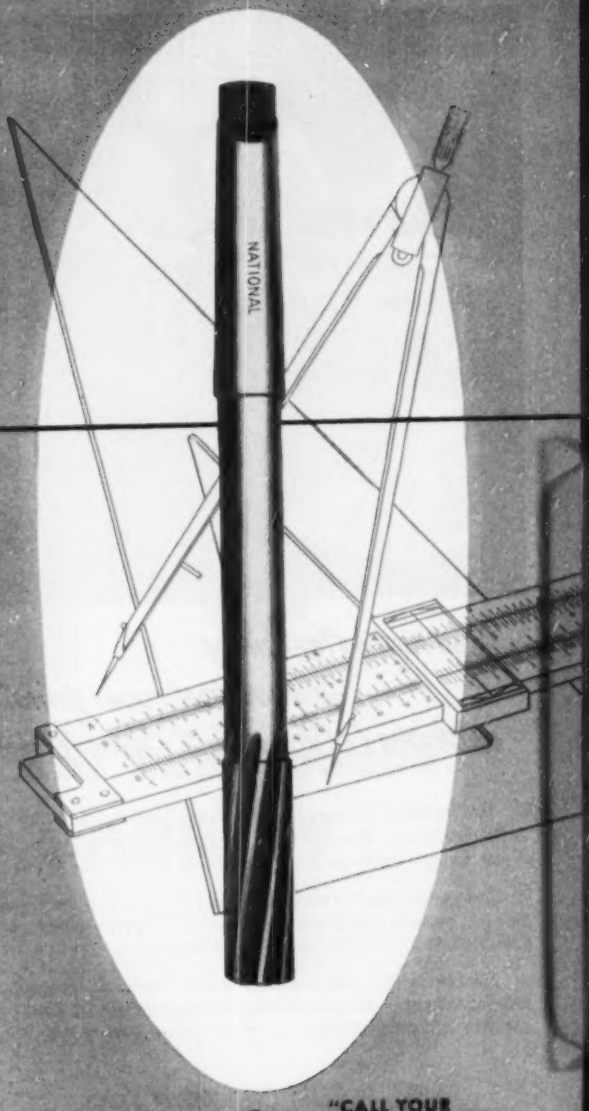
YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the telephone on your desk.

WINTER

WINTER BROTHERS COMPANY • Division of the National Twist Drill and Tool Company

Rochester, Michigan, U. S. A., Distributors in Principal Cities • Branches in New York, Detroit, Chicago, San Francisco

REAMING with NATIONAL REAMERS



Reaming consists of enlarging, smoothing, and bringing to exact size a previously made hole. To satisfactorily perform this important function a reamer must be properly designed, accurately sized and made, and have good wearing qualities.

These are the foremost considerations in the design and manufacture of National Reamers. Stock Reamers are carried in a wide variety of styles and sizes. Our engineers will assist in developing suitable reamers for your special jobs.

National also makes Twist Drills, Counterbores, Milling Cutters, End Mills, Hobs and Special Tools.

NATIONAL TWIST DRILL & TOOL ROCHESTER MICH. U.S.A.

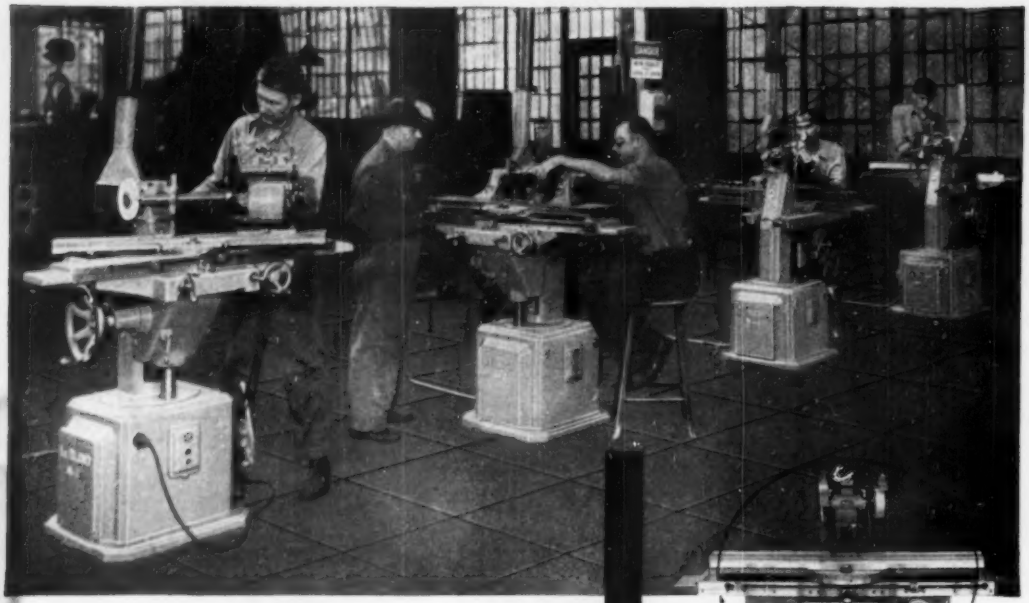
National

"CALL YOUR DISTRIBUTOR"

It is NATIONAL'S firm belief, based on long experience, that the local industrial distributor is the one best source for all staple industrial needs—including NATIONAL Metal Cutting Tools.

NATIONAL TWIST DRILL AND TOOL COMPANY • Rochester, Michigan, U. S. A.

Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco



get more flexibility in your tool room grinding with the LeBlond No. 2 Cutter Grinder

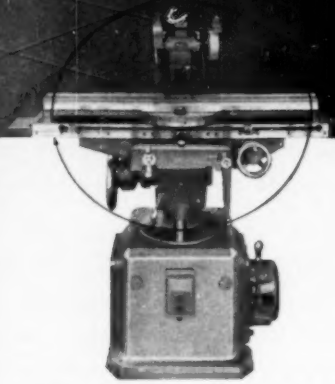
The flexibility for which the LeBlond No. 2 is noted is best illustrated by the photo above. You can operate it sitting or standing, from in front or in rear. Swing it around as you wish to get the precise angle required.

And you can count on the LeBlond No. 2 to deliver the correct speed for each job, because it is the only cutter grinder that gives you four speeds—6100, 5100, 4000, and 3100 rpm—easily and quickly.

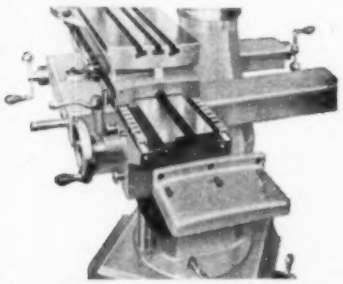
The LeBlond No. 2 offers so many ways of improving the quality and reducing the cost of tool room grinding, you won't be satisfied with anything less. Ask LeBlond distributor nearest you for descriptive bulletin today.

send for

your copy of the No. 2 Cutter Grinder bulletin. The valuable Manual of Tool Room Grinding is also available free of charge.



STATIONARY WHEEL HEAD and revolving table is the only design that can give you 4 speeds . . . all controlled by a single convenient lever.



ROLLER BEARING MOUNTING of sliding table assures long-life accuracy. Note the three slots on swivel table—two angular, one straight—another LeBlond exclusive.

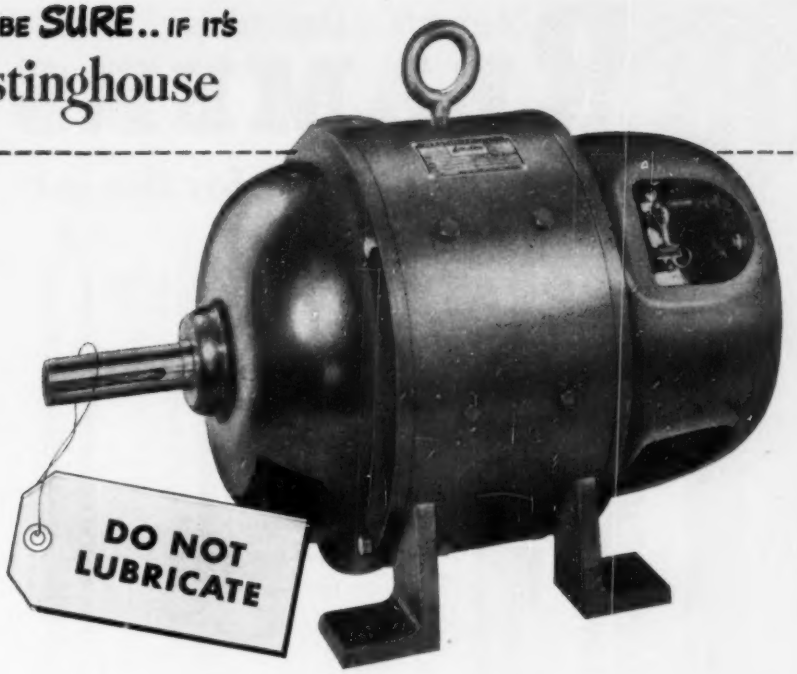
THE R. K. LeBLOND MACHINE TOOL CO. Cincinnati 8, Ohio
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

New York 6, N. Y., Singer Bldg., 149 Broadway, COurtland 7-6621
Chicago 6, Ill., 20 N. Wacker Drive, STAte 5561
Detroit 2, Michigan, New Center Building, TRinity 3-5561

LeBLOND

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



Something *NEW* has been added to SK DEPENDABILITY

You know the SK motor as the most dependable d-c motor in the business. Thirty-nine years of tough, rugged service have proved it. Now, retaining all the basic features of the old SK, we've added something new to bring new value to d-c motor users.

CAST BRASS BRUSHHOLDERS . . . are noncorroding. May be removed individually through spacious front openings. Stainless steel spring retains constant tension on brush.

MELAMINE ROCKER RING . . . is noncarbonizing when arcs occur across its surface. There's no tracking effect . . . no "burned in" paths to cause shorts that reduce motor efficiency.

PRE-LUBRICATED BALL BEARINGS . . . need no lubrication. Eliminate trouble and cost of greasing attention. Dirt stays out . . . grease stays in.

REINFORCED END BRACKETS . . . provide maximum rigidity, strength and correct bearing alignment . . . stand up to the shocking, jarring blows so often encountered in rugged d-c service.

SNAP-ON COVERS . . . eliminate screws and bolts. Stainless steel spring clips allow covers to be snapped on easily. To remove, just pry off with a screw driver.

TUFVAR WIRE . . . adds life to armature. Tougher, more flexible than conventional enamel, it stands up to long heat exposure . . . shows no tendency to crack or become brittle.

TAKE A MOTOR APART AND SEE. Ask your Westinghouse representative to show the Life-Line D-C Motor "Transvision". It takes a motor apart and puts it together again on your own desk top. You'll see the inside story of SK dependability . . . see why something new has been added. Call your local representative today. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-21550

Westinghouse *Life-Line* D-C Motors

Accurate...Dependable...Productive
REAMERS
—the right tools for the job
from stock at
PRATT & WHITNEY
and
BRANCH OFFICES

Located in: Birmingham* • Boston
Chicago • Cincinnati • Cleveland
Detroit • Los Angeles • New York
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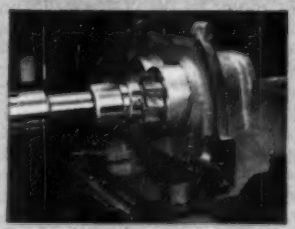
*Office only

Helical Taper Pin Reamer | Expansion Hand Reamer with Spiral Flutes | Hand Reamer with Spiral Flutes | Rose Reamer | Shell Reamer with Spiral Flutes | Stub Screw Machine Reamer | Jig Borer End Cutting Reamer | Blue Helix Fluted Chucking Reamer | Camlock Adjustable Chucking Reamer

Prime requisite for profitable reaming is precision and long life — which brings you directly to PRATT & WHITNEY, oldest and most progressive Reamer specialists in the country. Highly specialized skills and expert craftsmanship... in metallurgy, design, machining, heat treatment and inspection . . . give you the *right* tools for the job — *precision* Reamers that pay off in greater accuracies, increased productivity, and worthwhile cost-cutting economies. Order standard P&W Reamers from stock for prompt delivery. Contact your nearby Pratt & Whitney Branch Office.

● Carbide-tipped Chucking Reamers and Camlock Adjustable Shell and Chucking Reamers also available for prompt delivery.



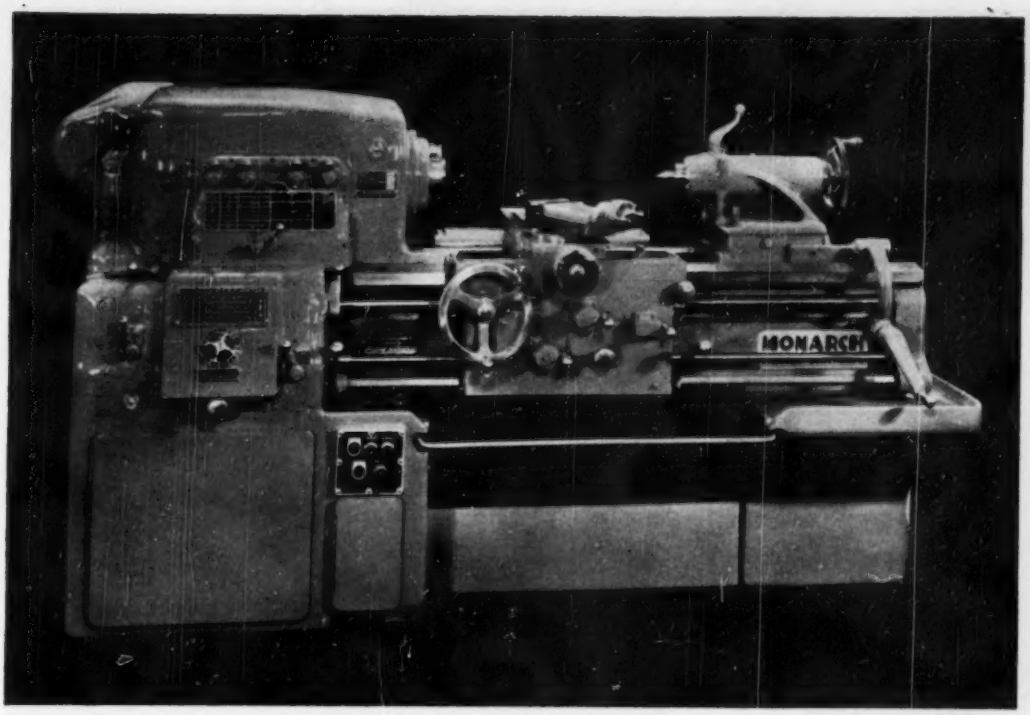
The right tool for the job: a Pratt & Whitney 5" diameter Camlock Adjustable Shell Reamer in use on horizontal boring mill, finish-reaming twin bores in a cast iron housing.

PRATT & WHITNEY
Division Niles-Bement-Pond Company
WEST HARTFORD 1, CONNECTICUT

MACHINE TOOLS • CUTTING TOOLS • GAGES

90th P&W Year

SYMBOL OF ACCURACY SINCE 1860



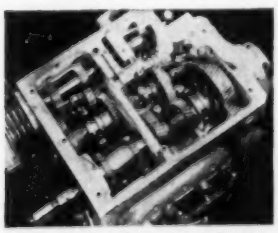
PRECISION POWER WHERE IT COUNTS —at its best on Series 60 Lathes

You'll get peak power—and long life at original accuracy in the—headstock of every Series 60 Lathe. Its extremely efficient design is characterized by two outstanding features, both pioneered by Monarch.

First, is the use of helical gears—all made of hardened alloy steel, and with ground or shaved tooth contours. The result is quieter, more efficient operation, with less waste power, less wear (and, as a result less down time).

Equally important is the extra-wide design of the Series 60 headstock gears. Not only is there more tooth contact at all times, providing more efficient transmission of power—but shifting is easier and faster (with less gear wear) by means of clutches instead of shifting the gears themselves.

An almost integral part of Monarch's superior headstock design is the American Standard Camlock Spindle Nose—a distinct advantage because of easier, faster, more rigid, more accurate mounting of chucks and fixtures.



Monarch Series 60 Headstock Gearing

These and many other design and construction features mean more savings with Monarch's Series 60 Machines, available in 14", 16" and 20" sizes. For complete information ask for Booklet 1113.

You'll Save on Maintenance and Operating Expense With These Series 60 Features:

1. Totally-enclosed gearbox and end gearing—preserves accuracy.
2. Automatic pressure lubrication—insures long life at original efficiency.
3. All anti-friction bearings—for peak power and less maintenance.
4. Hardened, ground or shaved, wide helical gears in headstock—for precision power, easier shifting.
5. American Standard Camlock Spindle Nose—for quick, rigid chuck and fixture mounting.
6. Flame-Hardened and Ground Bedways—preserves accuracy—proved on over 25,000 Monarch Lathes.
7. Induction hardening of many critical parts—for long, trouble-free life.

ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

THE MONARCH MACHINE TOOL CO. • SIDNEY, OHIO

Now Dialize Your AGD Snap Gages

Your AGD Adjustable Limit Snap Gage

+

STANDARD *Dializer**

*Patent Applied For

=

Low Cost Dial Gage

Easy to Install

Remove a pair of pins from an AGD Adjustable Limit Snap Gage . . . install this new STANDARD Dializer . . . and you have an indicating DIAL SNAP GAGE! It's as easy as that . . . and far less expensive than buying an equivalent dial snap gage.

Dializer No. 1 for Frames 1 thru 6
Dializer No. 2 for Frames 7 thru 10
Dializer No. 3 for Frames 11 thru 16

★ ASSURES ACCURACY by use of *double* reed principle.

OUT of the LUXURY CLASS!

NO LONGER can you afford to be without the benefits of quantitative dial measurements. The STANDARD *Dializer* is priced way below an equivalent Dial Snap Gage. Even if you have to buy a new AGD snap to convert, you save on an overall basis.

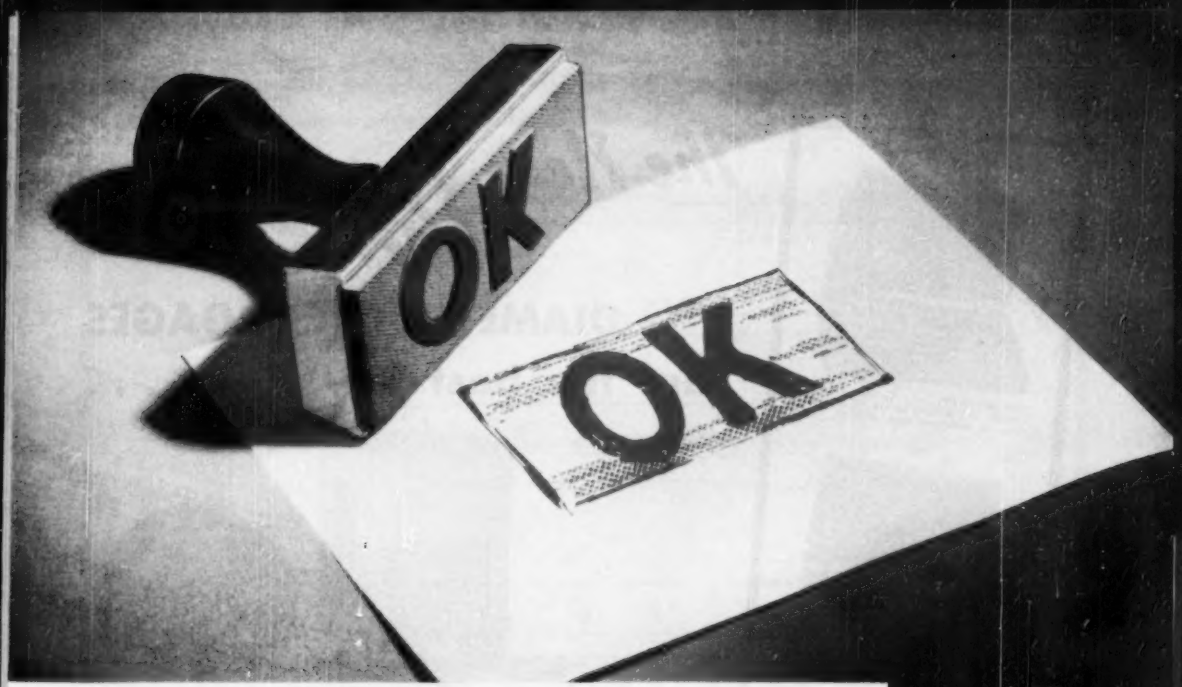
★ EASILY INSTALLED in your AGD Adjustable Limit Snap Gages . . . any make.

★ CONVERTS any AGD Model — A, B or C, any size.

★ RANGE OF ADJUSTMENT is same as before *dializing*.

★ INDICATOR furnished with either .0001" or .001" graduations.

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.



Operators Know

CIMCOOL IS TOPS!

Quiz the metal cutting operator who uses this revolutionary cutting fluid. He'll tell you that Cimcool® is the biggest working improvement in years.

Here's *why* Cimcool is superior to old-fashioned cutting fluids. It's a *chemical emulsion* incorporating a radically new and different principle in cutting fluids. It replaces all water emulsions and all but a few highly compounded specialty oils.

And here's *how* Cimcool makes jobs better. It's clean to work with, doesn't soil hands or clothes and contains no skin irritants. Cimcool leaves no hazardous slippery film on the hands, machine, work or floor. It cools so fast that tools and chips actually stay cool to the touch. And Cimcool virtually eliminates rancidity and foul odors—*even in the hottest weather.*

We honestly believe one test run will convince you. For a demonstration in one of your own machines, just write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or if you prefer, send for our free booklet "Cimcool Gives the Answers." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Company, Cincinnati 9, Ohio.

®Trade Mark Reg.U.S.Pat.Off.

Shop Set M77 . . . 35 blocks giving 140,000 combinations in ten thousandths. Price in mahogany case, $100.00.

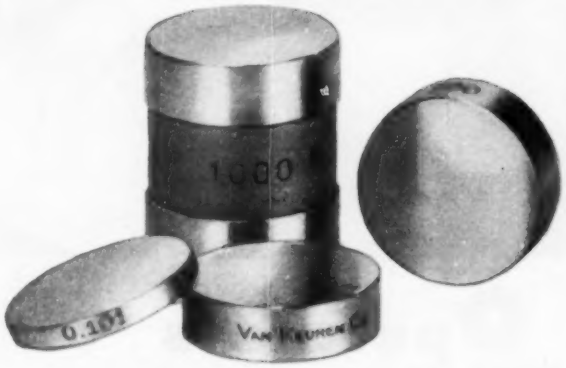
Economy Set M7 . . . Over 5000 combinations in thousandths. Price in mahogany case, $40.00.

Micrometer Set M21 . . . Includes 1", 2", 3", 4", 5" and 6" Microgages. Price in mahogany case, $68.00.

Toolmakers Set M64 . . . Given 121 combinations in 10ths, 32nds and 64ths. Price in mahogany case, $17.50.

The New Van Keuren

7/8 DIAMETER MICROGAGES are the best buy . . . . . .



60% More Wearing Surface . . . 25% Greater Accuracy . . . No increase in price.

A FOUNDATION FOR ACCURACY FOR 25 YEARS

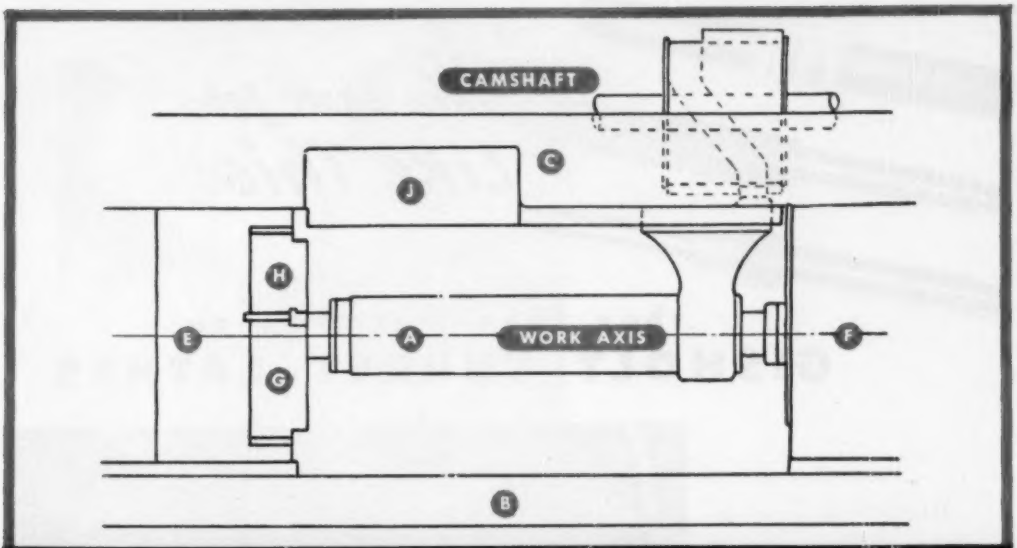
Van Keuren Microgages have been popular for over 25 years, because they provide a low cost means of securing accuracy in the shop, to meet the demands of the inspection department. The original Microgages were made 11/16" in diameter. The 7/8" body diameter of the NEW Microgages are ground true cylinders, and the end surfaces are held square with the body within close limits. This enables them to be easily aligned on machine ways for measuring carriage travel. The new Microgages have 40% more wearing surface than rectangular gages and they wring together tenaciously. The 7/8" diameter body provides excellent rigidity for the 6" long blocks.

Microgages up to 1" length are held within a tolerance of plus 12 millionths minus 8 millionths. They have an average wear allowance of 4 millionths oversize. They are available as individual gages from .0625" to 6" length, or in sets especially designed for general shop use, for tool setting and for tool makers and machinists.

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

31st YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires



THE *good* THAT MEN DO

The horizontal design Tooling Area, shown above, is a contribution by Frank L. Cone to the improvement of the Multiple Spindle Automatic Bar Machine that will live long after him. The advantages, stated below, are made possible by the machine's Overhead Camshaft. Specific data invites comparison.

THE TOOLING AREA OF THE CONOMATIC (1½" Six Spindle):

1. **Handles longer work than can be handled by the tooling area of any other "automatic."**

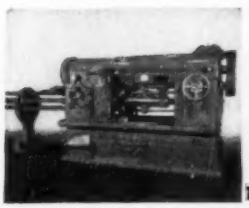
   The length of the Tooling Area is 46⅛ ins., which permits standard machining operations on work up to 18 ins. in length from the face of the cut-off tool.

2. **Is more strongly supported by the machine frame than is the tooling area of any other "automatic."**

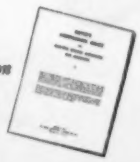
   The stocky Uprights, E and F, which are shorter than those of other "automatics," are securely bolted to — and held between — the Top Bed, C, and Base, B, which are larger and heavier than such members of other "automatics." *The Uprights are 22" high. The Top Bed is 8" high, 23" wide and 103¼" long. It weighs 1232 lbs. The Base is 33¾" high, 46" wide and 110" long. It weighs 6655 lbs.*

3. **Provides more Tooling positions than does any other "automatic."**

   The Main End Slide, A, has 6 positions. The Main Cross Slides, G and H, front and rear, have 6, and the Auxiliary Cross Slide, J, front and rear, are 2 more, which make a total of 14.



Buyer's Comparison Chart will guide you to full information



A Comparison of ALL Automatics is in Favor of Cone

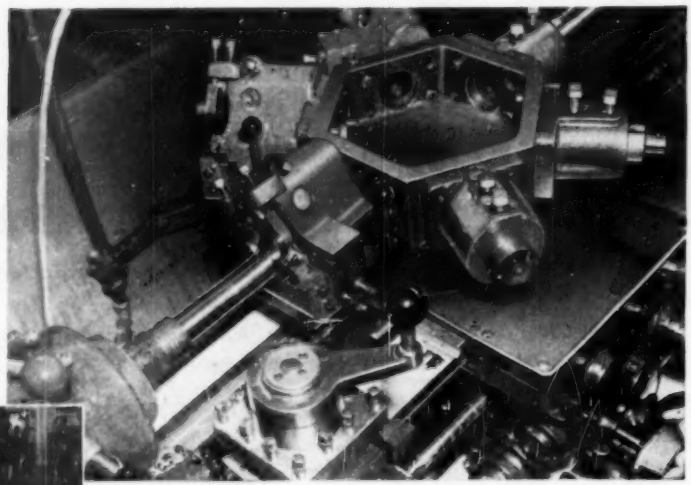
Conomatic

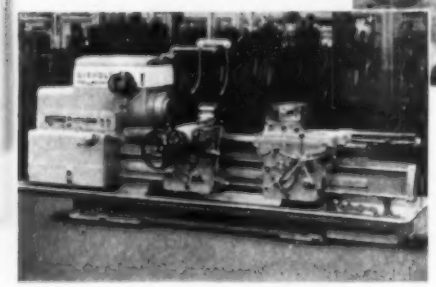
CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

take shaft jobs Like This:

they take less time on GISHOLT TURRET LATHES

Yes, even in lots as small as 5 or 10 parts, you can't beat turret lathes on this kind of work. Parts are machined complete in 2 operations—total time is less than 4 min.





THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

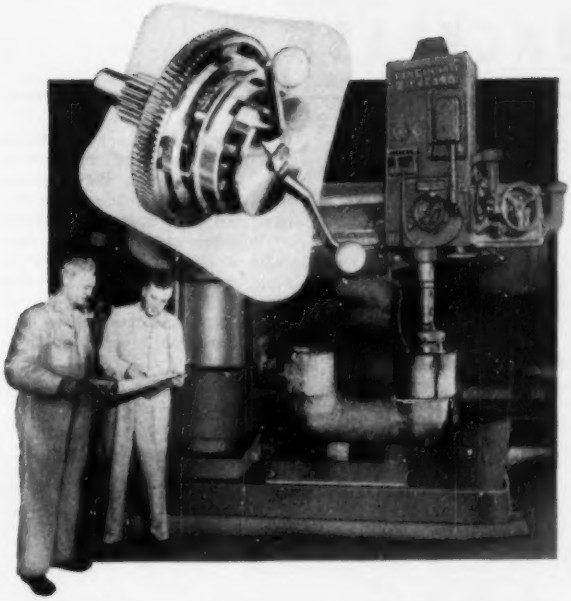
no extra equipment needed!

With no more than your standard bar equipment, you're all set to cut machining costs on shafts like these. No previous operations . . . such as cutting to length or centering . . . are necessary. And with *two or more tools* from turret and side carriage, you have the basic advantage of turret lathe economy—the time saving that means lower costs.

Before you turn to extra equipment or special attachments, look into the possibilities of doing the job the quick and easy way on Gisholt Turret Lathes. Gisholt engineers will gladly help you.

GISHOLT MACHINE COMPANY
MADISON 10, WISCONSIN

TURRET LATHES · AUTOMATIC LATHES · SUPERFINISHERS · BALANCERS · SPECIAL MACHINES



At the Wheland Company, Chattanooga, Tennessee, this 6' arm 19" diameter column SUPER SERVICE Radial is boring 11-1/8" diameter holes out to a finished size of **11-3/4" diameter** in cast steel pump parts, holding an accuracy of plus or minus .001".

11¾" in CAST STEEL

Heavy work is being performed with absolute safety on Cincinnati Bickford SUPER SERVICE drilling machines, with extreme ease of operation. Unlike any other, the SUPER SERVICE clutch is a sturdy positive tooth type. It has a large diameter hardened steel ring, with saw tooth serrations on the inner circumference, into which two opposed serrated hardened steel segments are snapped instantly by touching either one of the twin quick return levers. This requires only finger tip effort.

The feed is driven by the spindle through a safety feed gear. This is a patented exclusive feature of the SUPER SERVICE Radial and guarantees protection of this mechanism for the life of the machine, against damage due to over-load.

Write for further information about our complete line of Upright and Radial metal drilling machines.

Equal Efficiency of Every Unit
Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. **Cincinnati 9, Ohio U.S.A.**

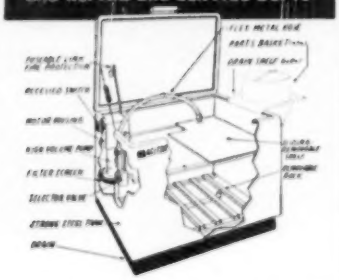
GRAY-MILLS

PUMPS and
COOLANT SYSTEMS

SAVE ON PRODUCTION COSTS

Tools last longer, cut better when Graymills Coolant Systems are used. Units available for all types of machine tools. Capacities 1 to 70 g.p.m. 1/30 to ½ HP. Up to 80 psi. Tank sizes 1 to 38 gallons. Prices as low as $41.50 for complete unit. See your distributor or send for literature.

GRAY-MILLS AGITOR
CLEANING UNITS
FOR THE TOOL ROOM, PRODUCTION, PLANT MAINTENANCE and REPAIR and SERVICE DEPTS.



Graymills New improved Agitor Cleaning units provide a safe, clean time-saving way to remove oil, grease, chips and grime from metal parts. Usually "cold" petroleum solvents, or solvent emulsion cleaners, are used.

3 Way Action. 1. High volume pump discharges solvent through hose, flushing holes, slots, etc. Clean dies this way; also parts before repair. 2. Entire tank agitates while parts soak. 3. Solvent discharged fountain-like for flushing castings, etc.

WRITE FOR LITERATURE

GRAYMILLS CORPORATION
Evanston, Ill.

BACKLASH

Quick-Acting Cams

The author of the article on rapid cam layout (*AM*—Mar 20, '50, p 123) presented a simple method of laying out an involute cam which overcomes the objections to one made with an eccentric arc. However, the last statement, "Pressure will develop directly through the cam center. . ." is not true.

Pressure is developed along the line tangent to the center circle, or pin, and this line is located half the diameter of the pin away from the line through the center of the circle.

C. A. Johnson
Springfield, Mass.

Steam Coolant

I have read with great interest your leading article, "Are We Slowpokes at Machining" on page 55 of *AM*, Dec. 29, 1949.

This brings back to my memory an article in the *American Machinist* of 1914, Vol. XL, page 61, "Steam Lubrication Foreshadows Revolution in Milling Practice". You will note in that article that cutting speeds of milling cutters ran as high as 835 fpm.

Why this development was not followed up I can never understand, but can only assume that the manufacturers of milling machines did not equip their machines with large enough pumps and coolant tanks and also sufficiently large space for the collection of swarf.

We have tried out the process to a limited extent in this factory and have found it quite successful. But to carry out our experiments we had to borrow a coolant tank belonging to a big grinder to provide sufficient flow and coolant. Also, we found it was necessary to make a coolant hood for every setup. Unfortunately, all our production runs are very small at the moment, but, when we get the chance to get into long-run production, we propose to exploit this development much further.

Another point that may be of interest was when I was in England in 1938, I had quite a long discussion with E. W. Field, then the head of H. W. Ward & Co., Birmingham, makers of turret lathes and, in discussing the problems of machining with tungsten carbide, he was very definite in his statement that when trouble was encountered the first thing they did was to increase the cutting speed and very often this cured the trouble.

J. Finlay
General Manager, Gov't. Small Arms Factories, Lithgow, N.S.W.

Jig-Borer Tables

Referring to the table for six holes (*AM*—May 29, '50, p 109), the last dimension in the "B" column should read 2.25 instead of 2.50.

C. A. Johnson
Springfield, Mass.

Mr. La Lond says in this article, "no similar tables have been published . . ." on these bolt-circle measurements. If Mr. La Lond is a jigborer operator and knows his stuff, he should have read the book which contains the complete set of tables he partly describes.

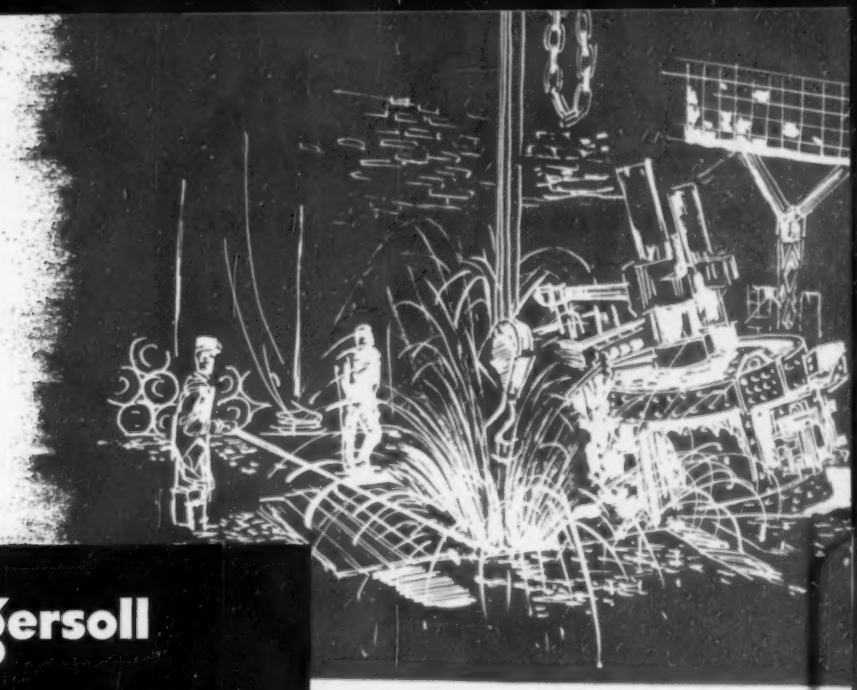
This book is "Precision Hole Location," by J. Robert Moore, published by the Moore Special Tool Co., has a complete set of Woodworth tables with dimensions for bolt circles with from 3 to 100 holes.

Robert L. Knoble
Buffalo, N. Y.

The Frosting That Failed

John R. Godfrey's article, "Too Well Done Costs Too Much" (*AM*, May 15), reminds me that I am a stickler for finish being put where it is necessary and not to have the costs run up by unnecessary elaborations. However, there was a time some forty years ago when I enjoyed a different production religion.

I was working on an adjustable spur-gear gage which consisted of a stationary plug on one end and an eccentric plug, with graduations registering differences in thousandths of an inch between the plugs, at the



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it's a "One Punch" argument . . . no more!

Each of the shells shown above . . . *each of them* . . . was *"Brehm-Trimmed"* with a single press stroke. One punch only!

That's what you can do with a Brehm "Shimmy" Trimming Die. The shells shown above are only a few of thousands of different shapes that are being *"Brehm-Trimmed"* constantly . . . with higher production rates and lower costs.

Materials? Almost anything . . . gold, silver, stainless or mild steel, copper, brass, zinc, aluminum, fiber, rubber or plastics.

Thicknesses? In actual manufacture, from .005 brass to .218 steel, a range likely to cover most of your normal requirements.

Quantities? As high as 1200 per hour, where the small shell and scrap were blown from the die. Electric iron covers at 625 per hour, and large refrigerator doors at 264 per hour!

Shapes? Fountain pen ferrules, watch cases, cigarette lighters, burial vaults, cameras, automotive and kitchen accessories, radio and television parts . . . oh, well, never mind . . . what shape do *you* need to trim in *your* manufacturing processes?

The part . . . *your* part . . . may have straight or curved edges, notches, angles or projections. A Brehm Die will trim it completely in one press stroke, leaving full-metal thickness edges, no burrs and no draw marks on the shell.

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other. To my young mind a gage was a gage, and I gave it the "toolmaker's" touch. When it was finished it looked like a frosted birthday cake. I had done my elaborating with furtive glances for fear the boss would come along before I had the thing finished—I wanted it to be a complete surprise because I was hoping for a couple of cents more an hour.

"Jeepers Cripus " (or equivalent), the foreman yelped as he finally got a look at it. "Where the blue blazes do you think you're working, at the Hamilton Watch Company?"

While my two cents per flew out the window, I recovered myself sufficiently to defend my efforts. "Look, Jess," I confided, "If you make a tool look like it's valuable the workers'll take better care of it."

"Yeah," replied the foreman, "And if the Super comes along before you clean off that damn frosting he'll raise particular Hell; so get busy."

So you see, John R., it's a cold unappreciative world. The artistic youth has a singing soul which says, "Knock 'em dead." while the older generation bathes in the cold satisfaction of cost-reducing utility.

John Homewood
Ontario, Calif.

•

Designer or "Drawer"?

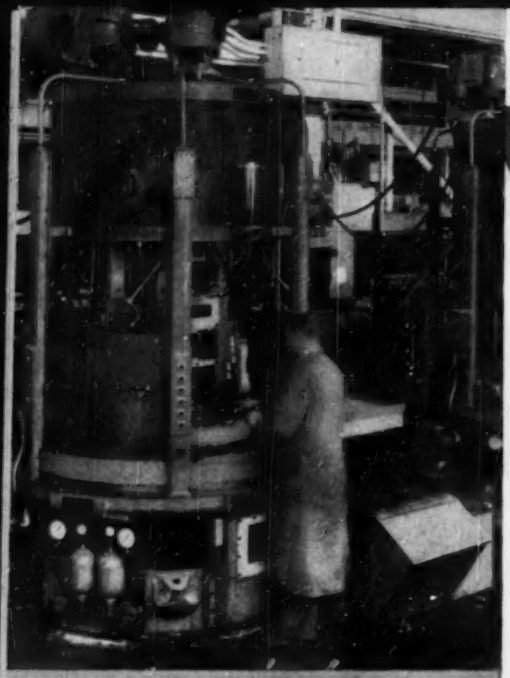
Re your article "" Well Done Costs Too Much" (*AM*, May 15,), the trouble with many tool designers is that too often they do exactly as they are told. In my 40 years of experience as a tool designer, checker and supervisor, I have come to this conclusion. Designers have a tendency to do exactly what the boss tells them or to follow a reference drawing which was poorly designed and which should never have been accepted by the customer.

I find that a reference drawing is usually all right to get a general idea of the design of the tool regarding stopping and clamping points, but to blindly draw the tool exactly as the reference is a mistake. The designer should have an opportunity to analyze the job before he draws a line. Also the designing supervisor should look over the reference drawing and suggest necessary changes to improve the job, and he should make it a point to encourage the designer to give the job a little thought.

A tool designer is a man who gives the job a little thought, but a tool *drawer* is a man who blindly follows a reference drawing or does exactly what his boss tells him to do, whether right or wrong.

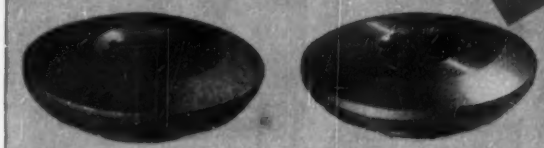
There are too many tool *drawers*.

A. C. Eagle
Dayton 3, Ohio



YPE "K" 6 STATION 12-SPINDLE MULT-AU-MATIC

83% INCREASE In Production



Type "K" Mult-Au-Matic 550 Pcs

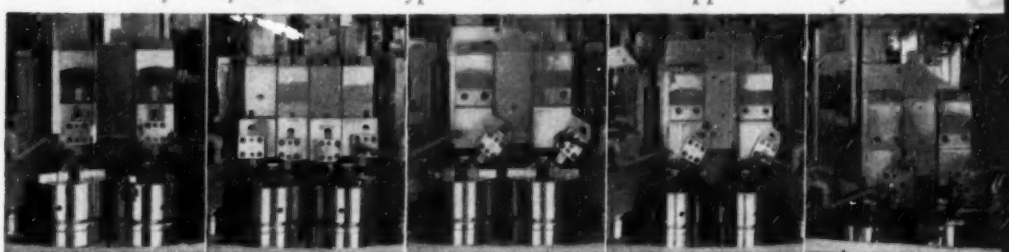
Type "D" Mult-Au-Matic 300 Pcs

A QUOTATION FROM THE FIELD:

"We were especially impressed on this job with the ease in which the operator was able to load and unload this machine at the rate of 550 pcs. per hour compared with the operator on the 8 spindle double index Type "D" Mult-Au-Matic on the same operation, who was busy trying to produce 300 per hour."

Twin spindles and twin tooling at each station, and each station with its succeeding operations, provides a progressive, high efficient Production Method on Differential Side Gears.

Ask for information on Type "K" Mult-Au-Matic application to your work.



STATION 2 STATION 3 STATION 4 STATION 5 STATION 6

Refinement in design, higher spindle speeds, faster index and in many cases an improved method for 1st and 2nd chucking on the same machine are only some of the factors that place the Type "K" Mult-AU-Matic in a class by itself for Productive Economies.

THE BULLARD COMPANY BRIDGEPORT 2, CONNECTICUT

A "Shot in the Arm"

THIS NEW STEEL PEPS UP PROFIT CURVES, TOO!

It's Union Drawn's new Bessemer Steel—B-1113-X. If your equipment and the design of your parts will accept higher speeds—if longer tool life is practical—B-1113-X may be just what you're looking for. A Union Drawn Field Service Man can give you the answer in a hurry. Why not now?

FOR SAGGING PROFIT CURVES

... Union Drawn's Improved

MACHINABILITY

Is *your* profit curve sagging under a heavy load of fixed operating costs? Is it growing weaker—even though your production curve grows stronger, continues to climb?

Why not give it the same kind of stimulant that has hastened profit curve recuperation for other steel parts manufacturers?

We mean Union Drawn's *improved* MACHINABILITY. It frequently gives parts production the "shot in the arm" that helps cut unit costs while stepping up efficiency. It puts backbone back into limp profit curves.

For more than 60 years, Union Drawn metallurgists and engineers have conducted relentless research in laboratory, in mill and in customers' plants. They've been searching for new ways to improve MACHINABILITY—and time after time they have found them.

That's what has made it possible to step up the MACHINABILITY of Union Cold Drawn Steels so many times.

That's why you may expect *uniformity* of cutting characteristics and structure—and by uniformity we mean steel bars that machine equally well whether shipped today, next week or next year.

That's why you get remarkable freedom from tool-wearing abrasives . . . smooth, bright machined surfaces . . . high output . . . low unit costs.

Here's what to do! Just ask us to send a Union Drawn metallurgist to your plant. He is ready to work with you—to help select the right steel—to see that it is used to produce best results—to give a husky boost to a sagging profit curve. Call your nearest Republic District Sales Office—or write us.

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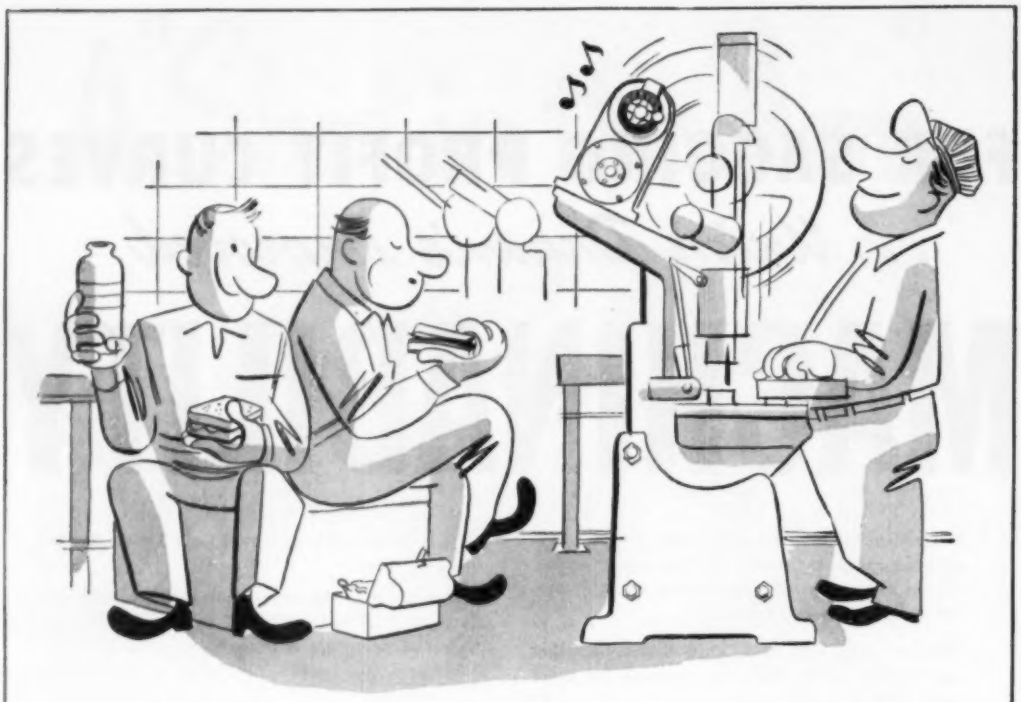

"...why, Bascom would rather run that Reeves-equipped machine than eat!"

THE 3 BASIC REEVES UNITS

VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over a wide range—2:1 to 16:1. Sizes—fractional to 87 hp.

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MOTODRIVE combines motor, speed varying mechanism and reduction gears in a single unit. Speed variations 2:1 to 6:1, inclusive. Sizes to 20 hp. (Also available in fractional hp sizes with speed variations to 10:1.)

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Recognized Leader in the Specialized Field of Speed Control Engineering

accurate • variable
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SPOT NEWS of Metalworking

- **Only "atomic" artillery shells you'll see in another war** will carry RW agents (radiological warfare). These are dustlike radio-isotopes, which would contaminate whole areas. You don't need A-bomb know-how to make them; just an atomic pile.

- **Navy's still secret 3-in. 70-cal. automatic antiaircraft gun** has topped 120 rounds per min. in firing tests. It takes a 4-in. projectile at the breach, "squeezed" to 3 inches at muzzle.

- **Steel shell cases have been made by cold-forming process** since 1936 by Italian firm of Bombrini Parodi-Delfino at Colleferro near Rome. Company started with ½-in. caliber shell cases and worked up eventually to 4-cm. cases.

Immediate speed-up of semi-dormant and tentative military projects the country over is reported as result of Korean war. Hasty conferences were rule in Detroit plants which previously had been war materiel sources. Everywhere definite production preparedness is in the air

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- **Needle slots only 0.0048 in. wide** have been made possible by use of carbide slitting saws. This development has aided ladies' hose manufacturers to make more sheer hosiery. Needle slots now used are 0.0068 in. in width.

- **Screwhead slotting machine which will finish** 24,000 units an hour with a spiral saw is being operated by Detroit metalworking company.

- **Production of stationary Mercedes-Benz diesel engines** types M.202 and M.204A will be resumed in the Berlin, Germany, works of Daimler-Benz of Stuttgart-Untertuerkheim. Necessary equipment already has been shipped from western Germany to Berlin.

- **B-36-G, first turboprop B-36 bomber with swept wings, will begin flight tests in 1952.** At least two bomber groups will be equipped with this plane. Boeing XB-52, eight-jet bomber to replace B-36, should be in production around 1954.

- **British machine tool officials declined suggestion** that their exhibition of British tools shown at Canadian International Fair at Toronto be retained intact for further showing at International Fair at Chicago next month. Significance: no concerted invasion of U. S. domestic market is contemplated.

Inspectors are not supervisors exempt from Taft-Hartley Law. NLRB so decided in refusing to exclude 25 inspectors from unit of 850 production employees for which CIO steel union is seeking bargaining rights at Reed & Prince, Worcester, Mass., screw manufacturer

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- **Electrometric isotope separation plant,** a machine which can "sieve" atoms of heavy elements such as uranium, dividing them according to slight variations in weight, has been completed by British Ministry of Supply at Harwell, Berkshire. Machine was built by Metropolitan-Vickers in conjunction with General Electric Ltd. and British Thomson-Houston Ltd. With this machine, scientists will gain knowledge which will help in design of future atomic piles.

- **Electrical goods manufacturing will be among several industries** in which, for first time, minimum wage rates will be set for work on government contracts of more than $10,000 (see Washington, page 71). Walsh-Healey Act officials are seeking data from 3000 companies.

- **If you employ truck drivers who spend almost all their time doing over-the-road driving,** NLRB will let them bargain separately from shop workers if they wish. Five drivers for McCord Corp., auto radiator producer at London, Ohio, will vote on whether they wish to quit United Mine Workers, District 50, and bargain through AFL Teamsters instead.

Now IMPROVED HOBBING OPERATION

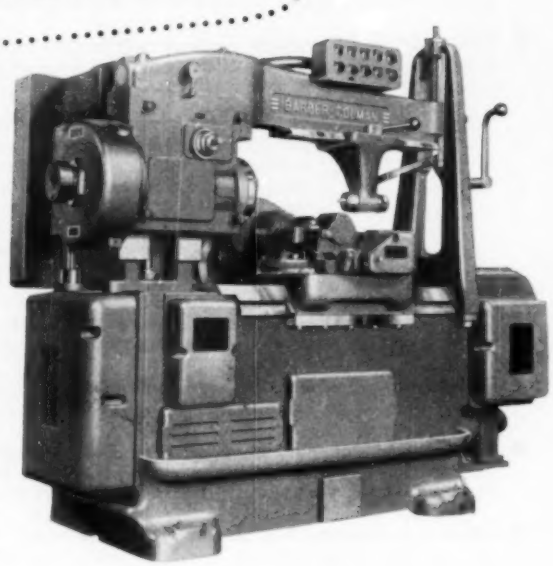
NEW LOW COST

on

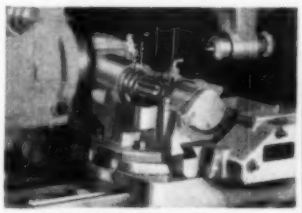
BARBER-COLMAN No. 16-16 HOBBING MACHINES

New construction and improved operating features — plus a new low base price — make the No. 16-16 Hobbing Machine the finest investment in gear cutting equipment today. Many improvements are the result of users suggestions, tried and tested in the field. Others are new developments by our own research division, proved to produce high quality gears at economies in cost. Combined, they offer a machine with a wider range* which is easier to operate and maintain.

Get in touch with your Barber-Colman representative today, and check these advantages on your gear production problems.



BRONZE INDEX GEAR, ONE FLAT—ONE VEE BEDWAY



NEW AUTOMATIC HOB SHIFTER
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NEW HOB SLIDE
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Washington

The Korean situation will not cause President Truman nor Secretary Johnson to be scared lightly into a big hike in defense spending.

They reason: any rapid expansion in Armed Forces unless followed by war would lead to "demobilization" later, with serious demoralization both here and abroad.

This may be the real crisis needed to force the lid off U. S. defense and foreign arms aid budgets. If you don't have the answer already, you'll get it in the weeks that follow.

One thing about the Korean attack: It swings bipartisan support squarely behind the Administration's foreign aid program at just the right time.

• • •

Ordnance procurement—trucks, guns, tanks—for defense will increase in any case. The buying rate will be up $750-million by 1953, even with no increase in the budget. Combat troop strength will be up too as the Johnson economy wave pays off.

• • •

Some $2-billion a year may be needed to keep Western Europe solvent after ECA ends in 1952. At least $1-billion would come from loans and private foreign investments, the rest as free grants.

Most of the money will go for capital development in southeast Asia, Africa, and the Near East, where Europe's biggest dollar earners are located.

• • •

Centralization of Army, Navy and Air Force research reports is aimed at getting more data to industry more quickly. Hereafter, all reports will funnel through an enlarged Central Air Documents Office, called CADO, at Wright-Patterson Field, Dayton, Ohio, for further dissemination to industry.

• • •

Dollar figure now being talked for the expected loan to Mexico now ranges over $100-million, instead of the $30-million we mentioned earlier. It's to be a general development loan by Export-Import Bank to purchase U.S. equipment.

• • •

A union may picket a truck at your loading dock if the union has a dispute with the trucking company: NLRB in the Shultz Refrigerated Service case.

But this is illegal — a secondary boycott — if the pickets stay after the truck leaves: NLRB in the Sterling Beverages case.

Still unanswered: whether a union can picket your entrance while truck is inside your yard.

Trend toward higher wages continues. It is fed by the General Motors 4-cent increase and the cost-of-living escalator. Latest BLS price index of 168.6 means a 2-cent raise in September, if it doesn't drop before then. Chances are it may even go up enough to warrant a 3-cent raise.

You'll get the first real sign of the size of any fifth-round wage increases when Philip Murray reopens the big steel contract Jan. 1. The $22-a-month the Social Security law amendments cut from the industry's pension obligations will be Mr. Murray's biggest bargaining point.

• • •

Veto of the basing point bill kills for some time any chance of legislative clarification of the delivered pricing muddle. You'll have to rely on court decisions to tell you what you can and cannot do. That's not always too clear.

• • •

Expansion and up-dating of Walsh-Healey wage minimums for work done on government contracts will include some new industries along with redeterminations in industries already under the act.

New industries will include batteries, petroleum refining, structural steel fabrication, office machinery, and others.

Redeterminations will be made on small arms, ammunition explosives, scientific, industrial and laboratory instruments, surgical instruments, other.

• • •

Government collections and payments won't have their customary deflationary impact in the first half of 1951. Main reason: The good business outlook which should keep employment high and the drain on unemployment insurance funds low.

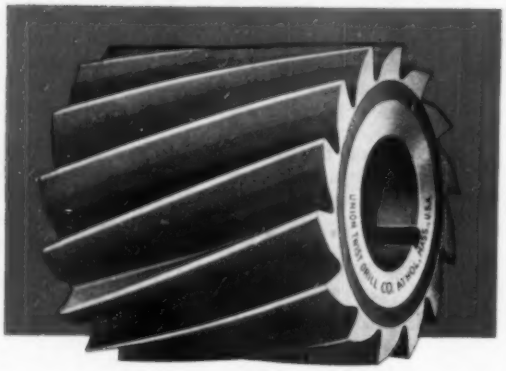
Also, when business is good, industry tends to fill civilian orders first, letting government business lag. This means disbursements for this purpose will lag.

Forecast is for a federal cash deficit of only $500-million Jan.-June 1951 instead of the $2.7-billion White House budgeteers estimated last January.

• • •

NLRB has ruled that any back pay ordered due an improperly discharged employee must be computed on a quarterly basis to protect Social Security benefits. NLRB also said that an employee to qualify for back pay must make a "reasonable effort" to find a job while waiting NSRB's decision.

You get minimum downtime, maximum work from UNION *milling cutters*



UNDERCUT TEETH with a special spiral angle give unusual efficiency to Union plain milling cutters. These teeth afford maximum strength, ample chip clearance in the fillet and permit reshorpening without rapid increase in the width of land.

TWO BIG BENEFITS you can count on when you use Union Milling Cutters: less time lost, more work done.

These performance-proved cutting tools tackle the toughest jobs in the shop . . . day in, day out . . . with a minimum downtime for reconditioning. ***They cut costs as well as metal.*** Union cutters work to closest tolerances . . . get outstanding results from older machines as well as the latest equipment.

If you are not already using Union tools, see your nearby Union distributor. He will be glad to work with you on any milling problem. You'll find his name in THOMAS' REGISTER on Union's insert in the "Drills, Twist" section.

A CUTTER FOR EVERY JOB

Whether you need special cutters built to your specifications or can use the standard Union cutters, there's a Union milling cutter to meet your needs. Following is a partial list —

Plain Milling Cutters	**Keyseat Cutters**
Helical Milling Cutters	**End Mills**
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Screw Slotting Cutters	**Convex Cutters**
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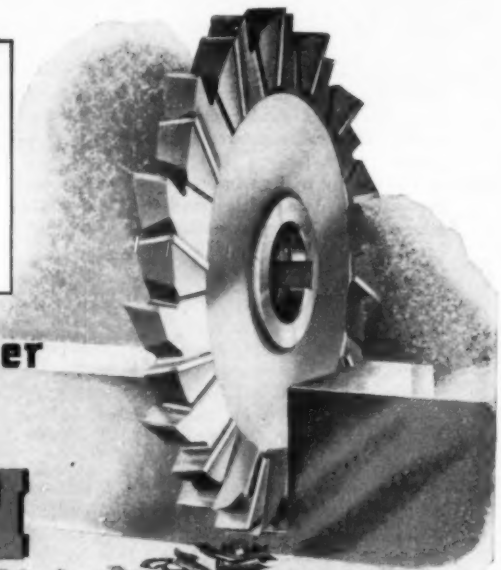

no other milling cutter will outperform a UNION

contact your local distributor

His name is listed in Union's THOMAS' REGISTER insert under the heading, "Drills, Twist".

UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

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Detroit

Ever dream of an 8 million car year? C. E. Wilson, president of General Motors, says one is possible in 1950. Output has been running at a rate (U. S. and Canadian plants combined, cars and trucks both) in excess of 200,000 units a week. That would make 8 million quite comfortably. July schedules are generally equal to those of June, which were by far the highest in history.

• • •

Expectations are for some slackening in August, then a definite letdown during September, when carmakers will begin to clear up inventories in preparation for model changeovers. The first six months of the year saw produced (in spite of the 100-day Chrysler strike) just shy of 4-million vehicles. July may add another 750,000 to that total, August about 650,000 more, September upwards of a half-million. That would start the industry heading into the fourth quarter with somewhere between 5.5-million and 6-million jobs already built.

• • •

The current stratospheric production totals have momentarily taken the heat off tooling requirements for changeovers. While business is so good, producers are in no hurry for new models, with their attendant plant shutdowns or curtailments.

• • •

But there is plenty of hurry for equipment with which to enlarge manufacturing bottlenecks. Example: The Olds decision to enlarge 8-cylinder engine production (while discontinuing 6's entirely) at Lansing. Required will be about 100 machine tools, nearly all of them duplicating present equipment. Releases are going forward currently, the large share to the companies which furnished the original machines being duplicated.

• • •

Packard, not too successful in 1949-50, is betting on a sharp comeback for 1951, and pushed ahead its model year by going down during June for changeover. New models will start coming off its lines this month. New jobs are said to be strikingly attractive, though actually little is known about their details. They were largely tooled at Briggs.

• • •

Kaiser-Frazer of Canada, Ltd., is tooling to use the assembly facilities of Reo Motors of Canada at Leaside, on the outskirts of Toronto, to build ten Kaiser cars per day. Reo is continuing its customary output of trucks and buses in the plant. Production will begin late in July and will reach capacity a month later.

Nash will expand its facilities for production of its Rambler line; plant equipping is already in progress. For 1951 the Wisconsin entry in the automobile industry anticipates producing at least a third of its total output in lowest priced line.

• • •

Studebaker Corp. will be in the market for equipment shortly for a new assembly plant in northern New Jersey for Atlantic coast (and probably export) requirements. Manufacturing operations will continue localized at South Bend.

• • •

Factory employment in the Detroit area, impelled by auto plant production rates, rose to a peacetime peak of 620,000 men and women as of mid-June. The previous top was November 1948, when 614,000 were on payrolls. Unemployment dropped to 50,000 from May's 62,000, but was still well above the November 1948 peacetime low of 33,000—indicative of the growing size of the Detroit labor market. Unemployment insurance claims have declined for four months without a break.

• • •

Labor is peaceable, largely because of sizable management concessions. Ever since the General Motors contract with the CIO United Auto Workers, new agreements have beeen reached with one and another of the major automotive firms, all with goodly concessions. Most general pattern: The $100-at-65 for 25-year seniority workers, *including* a guarantee of payments from the company fund regardless of whether Social Security is increased. That is, workers will share in part in contemplated enlargements in federal grants.

• • •

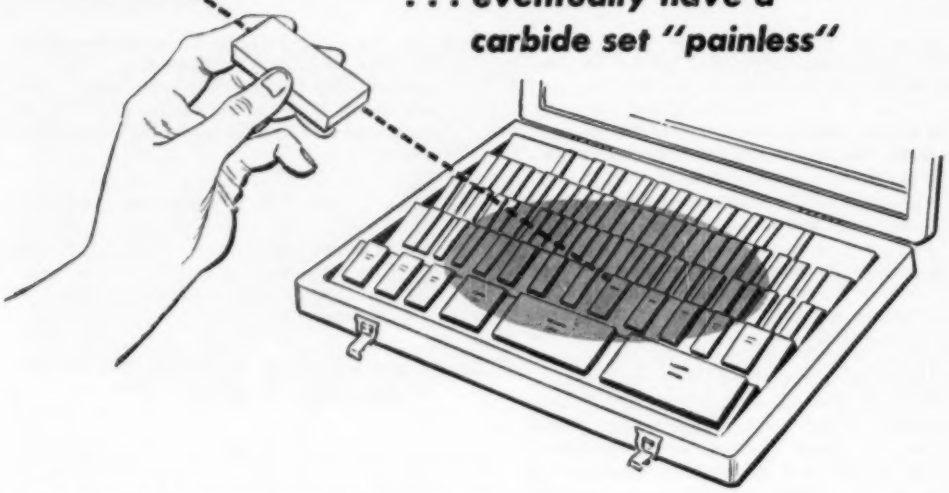
Milestones: The past few weeks have seen built (a) the 24-millionth Chevrolet; (b) the 1-millionth Olds equipped with Hydra-Matic transmission; (c) the 100,000th Powerglide transmission of Chevrolet.

• • •

Some auto companies—and parts makers as well— are screaming loudly behind locked doors over the steel situation. They maintain the major steel companies have favored the big three producers to their detriment. Accordingly, they claim, they are being forced to buy more conversion steel in proportion to their size than big manufacturers—and conversion steel increases prices per car by $50 or more, at today's levels!

Replace worn blocks with CARBIDE

. . . eventually have a carbide set "painless"



A few blocks in every set are in constant use. They wear faster and are replaced at a faster rate than other blocks of the same set.

Replace them now with carbide Carblox and follow that policy on future replacements and your present set will be eventually converted to long-wearing carbide.

Here's the "painless" method to acquire Carblox, the blocks that outwear steel many times. No need for a special appropriation or a board session to approve the expenditure. Send your suspected blocks to us now with instructions to replace them. Or send us the entire set for inspection and recalibration. The prices of individual Carblox have been lowered substantially to make cost of such conversion easier to absorb.

THE WEBBER GAGE COMPANY
12901 Triskett Road • Cleveland 11, Ohio

No More Accurate Block Available Anywhere . . .

Examinations in customers plants who have facilities for detecting errors in millionths of an inch, have repeatedly demonstrated that no more accurate block is available anywhere. On the average, the actual dimensions showed a fraction of the tolerance that Webber specifications allow in manufacture.

INSPECTION AND RECALIBRATION OF 84-BLOCK SET

Submit sets for periodic inspection to determine degree of wear. Sets will be returned with a Certificate of Inspection showing actual dimensions of each block and recommendations for replacement of those blocks worn beyond reasonable limits. **$15**

NEW LOWER PRICES ON INDIVIDUAL CARBLOX

A growing volume of carbide replacement business has enabled Webber to effect economies in production of individual blocks which are being passed on to the user. If you do not have the June 1st price supplement on Carblox, write for your copy. Note: This new price reduction does not apply to the complete set—only to individual carbide blocks.

Webber
MICRO-ACCURATE GAGE BLOCKS and FIXTURES

Standard Steel Blocks
Carblox Carbide Blocks
Angle Blocks
Heavy-Duty Blocks, Fixtures
Special Size Blocks

New Tooling

The war crisis is not expected to yield any increased machine tool orders in the near future. Neither Army Ordnance nor Air Force will have tooling programs beyond those already planned, unless some new development in international situation alters Washington's thinking.

• • •

Reports are false that any change will be made soon in status of phantom orders. These orders, now in hands of machine tool builders, will not become real orders until war mobilization takes place. Such mobilization is not contemplated at this time. What's more, phantom orders need a Congressional appropriation before they mean anything.

• • •

Effect of Korean intervention by U. S. adds up to nothing at all, so far as machine tool business is concerned. Later in the year, as events unfold, it may be a different story.

• • •

Washington has been a bit sticky about granting some export licenses for machine tools for England, France and Italy. Reason: Federal officials fear that they will be used to produce ball bearings and other potential war items to be shipped to Soviet Russia or her satellites.

Protests against these hold-ups of licenses have got results. Here is the successful argument: Better to take a chance on Russia's getting some ball bearings from western Europe than to have her build up her own ball bearing facilities because she cannot buy bearings outside.

• • •

Machine tool prices are trending upward. Several makers have announced advances in recent weeks ranging from 3 to 20%. But the rise is not yet general.

• • •

It appears doubtful that June orders for machine tools touched the May mark, which was almost tops for the postwar period. July and August probably will come up with less volume than June, though builders expect to close some nice business during the summer.

• • •

Automotive retooling still sparks the machine tool business. New interest centers on what Chrysler Corp. may do about a new Dodge engine. Already under way is tooling for a Chrysler V-eight motor, probably to be made at Jefferson Avenue plant in Detroit. Dodge will be next on list after Chrysler. And then will come Plymouth.

How fast this entire cycle of new engines will be introduced depends mostly on competitive situation. If retail sales continue fabulous there's no hurry.

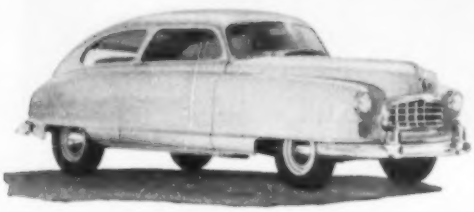
• • •

Construction of new Chrysler sheet metal stamping plant is progressing in northeastern Detroit near tank arsenal.

• • •

Air Force is reported taking close look at machine tools it owns in contractors' plants to see what condition they are in. Result: many machines are badly beat-up and need to be replaced. Air Force is ordering some new standard machines on this basis. So many changes are made in engines to be machined that general-purpose tools are more useful and economical than specials.

AUTOMATIC CONTOUR CONTROL—Arma Corp., Brooklyn, N. Y., demonstrated use of an assembly of Armatrol (small electronic units) to control step-machining to a few tenths for dia and length. Trained personnel punch piano roll in about 15 min. for such jobs, so assembly provides digital control of carriage and cross-slide movements. Piano roll is run through control cabinet (right) and machine produces part automatically in 4 min. and stops. Operator might take 30 min. to make same piece. System is applicable to jig borers, milling machines, grinders, die sinkers, etc. Cams can be milled or ground because formulas for contours can be reduced to piano-roll punchings. After making one or 100 parts, piano roll is filed for future reuse



1000-TON side housing double action Lake Erie hydraulic press in the Nash Motor Body Plant. Press has 700-ton main ram, 300-ton clamp platen and 125-ton die cushion. Main ram stroke is 42", clamp platen stroke 27", and cushion stroke 10". Daylight for the punch slide is 114" and for the clamp slide 96". Bed size is 120" right to left between housings and 64" front to back. Presses of this general type are available in a wide variety of sizes to meet every known need.

NASH MOTORS

reduces rejects...saves production time with LAKE ERIE Hydraulic Press

LAKE ERIE
ENGINEERING CORP.
BUFFALO, N.Y. U.S.A.

THE ABILITY OF LAKE ERIE PRESSES to maintain constant pressure and speed . . . and ability to adjust pressure to meet changing conditions of steel in production of deep drawn parts are among other advantages proved at Nash.

Lake Erie hydraulic press shown forming center pillars for Nash automobiles. The pillars are narrow in the center and wide on each end making it necessary to maintain an even pressure and a constant drawing speed. This is easily and automatically accomplished on the Lake Erie Press illustrated.

The Nash Motors Division of Nash-Kelvinator Corporation have learned the value of Lake Erie hydraulic presses from their experience with this 1000-ton double action unit in their body plant at Milwaukee. The press is used for deep drawn metal stampings. Nash Body Plant staff members list three features of their hydraulic press performance as especially outstanding:

1. "The present design of our center pillar is very narrow in the center and wide on each end, having a drawn depth of 6½ inches. Because of this it is imperative to maintain an even pressure and a constant drawing speed. The hydraulic press does this and reduces the percentage of rejected drawn panels.

2. "Since the pressure gauges are always in sight, the operator knows exactly what is happening in the die and can change the pressure to meet the changing conditions of the steel.

3. "By being able to regulate the stroke of the press, lost time is eliminated both in production and in set-up time on dies."

Not only in the Nash Body Plant, but in hundreds of other plants today, Lake Erie hydraulic presses are speeding production, saving time and money, simplifying manufacture and improving product quality. If you fabricate metal, these same savings and advantages are available to you. A consultation with one of our engineers will cost you nothing . . . may result in ideas and suggestions that will save you thousands. Why not try it. Write or phone us.

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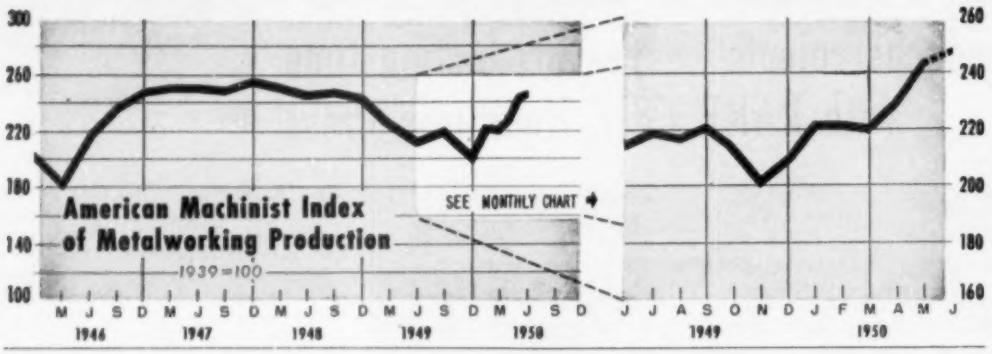
Gaging Metalworking



Korea Assures High Metalworking Output

It's a sure bet that the Korean war means a step-up in metalworking activities during last half of '50. It is too early to forecast how much military materiel will actually be ordered, however, and to tell what new tooling programs will be activated, if any.

• • •

The fact is that many hurried conferences have taken place in Detroit and elsewhere since South Korea was attacked. Military officials and manufacturers have conferred in the tensest atmosphere since 1945.

Bear in mind that Metalworking is the center of military goods production. A look at AMERICAN MACHINIST's Index confirms this. The index rose to a peak of 440 in 1943 (1939 taken as 100), whereas industrial production generally didn't get above 240. Remember that this is on basis of manhours worked.

Regardless of whether defense business proves to be much or little, Far Eastern crisis is likely to start a new wave of consumer buying. Paul Hoffman said recently that fear of war is now a major element in booming automobile market. People are getting new cars while they can.

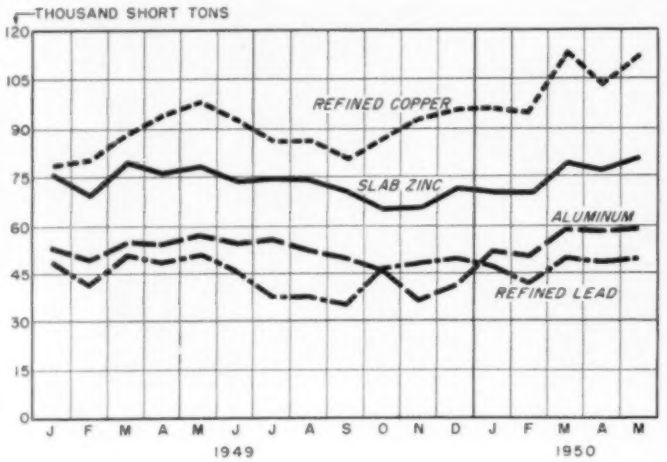
Look for little slack in either manpower or materials, under the circumstances. Truman's advisors think that extra $2 or $3 billion of defense spending can be done without inviting dangerous inflation. Above that, controls will be needed to regulate material flow and prices.

• • •

Though steel mills have run above rated capacity since late April, production cannot keep up with demand. Some strip mills have boosted prices $3 to $10 a ton; others are not expected to follow this lead immediately.

Production of Non-ferrous Metals Hitting New Peaks

1949	Aluminum	Refined Copper	Refined Lead	Slab Zinc
Jan.	53.4	78.3	48.8	75.8
Feb.	49.7	80.3	42.3	69.2
Mar.	54.9	88.2	51.4	78.1
Apr.	54.1	93.9	49.0	75.9
May	56.9	98.1	51.2	77.5
June	54.2	92.1	45.5	74.0
July	55.8	85.6	38.3	74.6
Aug.	52.0	85.6	37.8	73.8
Sept.	49.7	79.9	34.9	70.4
Oct.	45.8	86.9	46.2	64.4
Nov.	35.9	92.6	48.5	65.1
Dec.	41.2	94.9	48.9	71.3
1950				
Jan.	52.0	95.2	47.5	69.9
Feb.	50.4	94.0	41.7	69.6
Mar.	58.7	113.4	49.1	77.9
Apr.	58.0	103.3	48.2	75.9
May	59.0	112.4	49.0	79.6



INDEX

	JUNE '50	MAY '50(p)	APR '50(r)	MAY '49
	247*	243	231	215
Machinery		227	223	211
Electrical Manufacturing		292	278	240
Automobiles, Trucks		232	205	173
Transportation Equipment		213	212	244
Other Metalworking		256	251	228

AMERICAN MACHINIST'S INDEX OF METALWORKING PRODUCTION is based on manhours worked in the five components above.

*Estimated (p) Preliminary (r) Revised

Most of user tonnage allocations from sheet and strip mills have been slashed in order to cut down mill backlogs to workable size. Result: many steel consumers are faced by dwindling stocks at time when output is up in the sky and promises to stay there.

Big steel users are making special effort to accumulate all possible scrap to return to mills, thus alleviating scrap shortage.

• • •

Heavy steel products (bars, plates, structurals) are tight because of brisk demand and decision of some mills to divert substantial amount of available ingots to sheet production at expense of less profitable heavy items.

• • •

Chances of steel orders getting back to lower levels by end of year are close to zero. Steel people had anticipated that slowdown in automobile sales would ease pressure for flat-rolled items late in year. But prospects are that automobiles and other consumer goods will breeze right through the year without much letdown.

Take a look at appliances. General Electric's sales were 20% more in first half than in comparable 1949 period. Current level is above management's expectations. Output in third quarter will match that earlier in year, with increase likely in final quarter.

• • •

Household washers, dryers and ironers came close this year to all-time record set in 1948. Washer sales in January-May period were 64% above same months last year. Dryer sales in those months exceeded sales in all of 1949.

Old records are falling right and left. Car and truck assemblies in June hit a new peak—850,000 units. Television hopes to raise production to 1 million sets a month by year's end. Electric power usage recently has topped last Christmas' high.

• • •

Don't look for any quick increase in ordnance or plane orders, despite all that you may hear about "war preparations." Washington doesn't want anything resembling full-scale war mobilization unless the situation becomes far more critical than it now appears.

No immediate pickup in operations at Army and Navy ordnance plants and arsenals is contemplated. And there is no intention of putting into force such defense measures as "phantom orders" for machine tools.

• • •

Nonferrous metals are in short supply and prices have been bounding up. Major producers of copper are allocating tonnages to users. In fact, many fabricators are running short hours because of lack of raw copper.

• • •

AMERICAN MACHINIST'S metalworking index was estimated at 247 for June—2½ times more than 1939. But July idleness through mass plant vacations will lower index this month.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week index of activity (1923-1925 = 100)*	216.9	215.6	186.2
Steel ingot operations (% of capacity)	101.2	101.2	84.4
Electric power output (million kilowatt-hours)	6102	6012	5466
Production of automobiles and trucks	205,820	204,704	153,001
Engineering construction awards (Eng. News-Record; millions)	$287.6	$256.2	$180.9

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production* (1935-1939 = 100)	189	187	179
Index of durable manufacturers production* (1935-1939 = 100)	221	212	212
Durable goods manufacturers' sales* (millions)	$7,930	$8,127	$7,445
Electrical machinery manufacturers' sales* (millions)	$825	$885	$720
Other machinery manufacturers' sales* (millions)	$1,228	$1,272	$1,261
Durable goods manufacturers' new orders (millions)	$8,380	$9,075	$6,127
Electrical machinery manufacturers' new orders (millions)	$810	$1,006	$619
Other machinery manufacturers' new orders (millions)	$1,362	$1,396	$985

*Seasonally adjusted.

STEP UP PRECISION PRODUCTION... FOR LOWER COSTS

Every MORRIS MOR-SPEED Production Machine represents a manufacturing problem transformed into a routine operation, performed with time and labor saving speed and ease.

This adaptation of a standard type MORRIS Production Machine combines drilling, countersinking and taper reaming operations on an end cap for a large appliance manufacturer. Parts are automatically clamped in position with a power wrench, after which the three operations are performed automatically, in sequence on each of three lead holes. The separate coolant system, with removable chip basket, makes chip removal quick and easy.

If your work requires drilling, reaming, tapping or similar operations, on a production basis, MORRIS Machine Tool engineers will gladly show you how much can be saved . . . in time, money, effort and space . . . by a MOR-SPEED Production Machine.

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Challenge to Productivity

Is it fantastic to expect that an hour's factory work 30 years from now will buy twice as much in real goods as it does today?

The Committee for Economic Development doesn't think it is fantastic at all. In fact it predicts doubled buying power. But there is a catch in it. Production per manhour must continue to rise at the same average rate as in the past.

IF THIS desirable event is to come about, CED thinks that these five objectives must be attained: (1) revolutionary changes in production processes; (2) more plant equipment and materials to help workers produce; (3) notable advances in health, training and skill of the labor force; (4) improvements in methods of management; and (5) more interested workers.

These objectives will not be achieved automatically, CED says. Certain specific things should be done.

For one, more rapid replacement of old equipment should be stimulated. For another, the tax system should be reformed to make risk-taking more attractive. Again, incentives for efficiency among employees should be improved and featherbedding should be abolished.

CED points out that doubling of output per manhour by 1980 "cannot be achieved by attempting to get men to make a greater physical exertion."

HERE THEN is a challenge to every influential element in our economy to contribute its share to our future progress.

Machinery builders must contribute their inventiveness and resourcefulness in the art of producing even better machines than today's. Our engineers must improve and refine still further our production techniques.

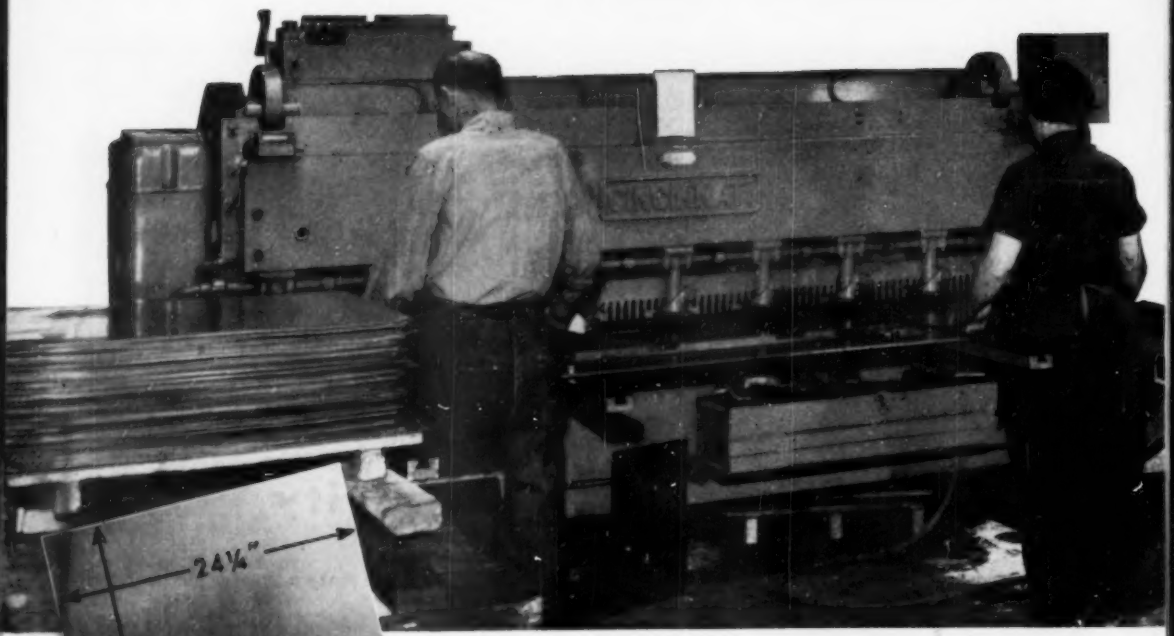
Management must be alert to take advantage of every opportunity to increase efficiency and to work cooperatively with labor. Labor in turn has a real obligation to do a day's work for a day's pay.

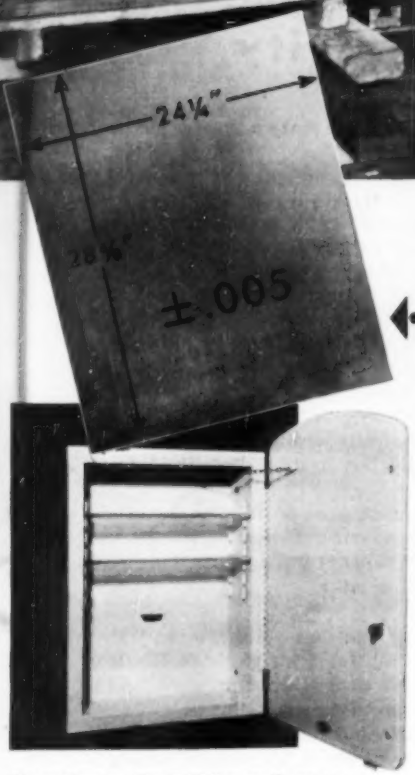
And government must do its part, by establishing a fair tax system, to lend encouragement and support to industry in its efforts to expand, to replace, to take risks.

THE TASK will not be easy. Perhaps CED has set the sights too high. But it is a noble objective toward which to strive and is worthy of the best efforts of all of us.

Let's keep in mind that improvement in the real purchasing power of the average worker is the best possible way to insure a permanently high level of prosperity and economic stability.

Burnham Finney





ALL ALONG THE LINE

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SAVES MONEY!

At 400 an hour, accurate steel blanks, 24¼" x 28⅝", are produced in lots of 10,000 from 26 gauge stock sheets.

Costs are low because of the accurate performance, rapid gauging, ease of control and safety features of Cincinnati All-Steel Shears. One and one-half to two million cuts are made before knives need regrinding—an important factor in the low cost.

The shear is so accurate that all along the production line rejects are very low. Gauging for forming and bending operations is simple and rapid, assembly is smooth, time and money are saved, and a high quality of product is maintained.

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Photos Courtesy The F. H. Lawson Company

These accurate blanks are held to tolerances of ± .005" on Cincinnati Shears in the shops of The F. H. Lawson Company, manufacturers of medicine cabinets, pails and all sorts of containers.

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THE CINCINNATI SHAPER CO.

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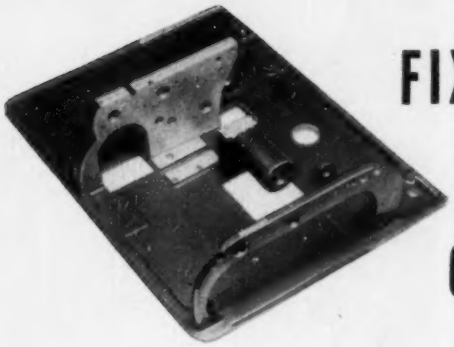
SHAPERS SHEARS BRAKES



FIXTURES TO MULTI-DRILL COMPLEX FRAMES

Complicated fixtures were required to make simple loading and accurate location when Dictaphone switched to way drilling for Time-Master frames. It's paying off in tripled production

BY ANDERSON ASHBURN, ASSOCIATE EDITOR

BASE OF The Dictaphone Time-Master (the plastic-belt dictating machine) is the frame shown above. All of the operating mechanism and the cover attach to this frame and a number of shafts operate in bushings fitted into the upright sections.

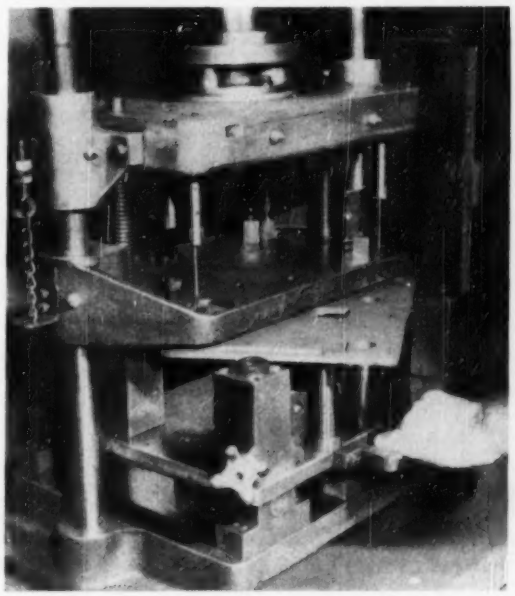
These requirements add up to 170 drilling, counte.sinking, counterboring, tapping, and reaming operations. Originally they were performed one at a time in single-spindle gang drills with jigs to locate the work.

Production has been tripled and quality increased by tooling two horizontal and four vertical Natco machines to do the job.

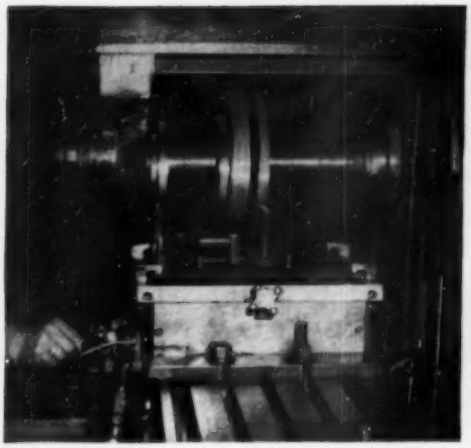
Die-cast frames are painted before processing, which eliminates the problem of paint in the holes. Four locating pads are sanded, two locating holes are drilled, and several surfaces are milled. Frames are then processed through ten positions in the six machines and are ready for assembly.

The first machine requires 25 gallons of cutting oil, and the others somewhat smaller quantities. Lusol is now used as coolant on all six machines.

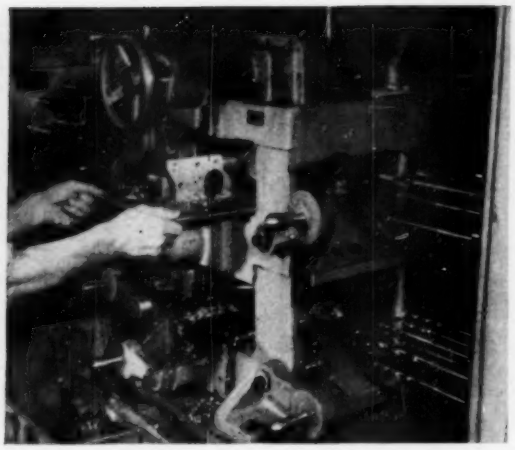
The fixtures that guide the frames through this forest of drills include some unusual and ingenious features that are described on these pages.



LOCATING HOLES at two diagonally opposite corners are drilled and reamed in this fixture on an Allen drill press. Work indexes in floating position on the slide which is pushed to rear limit to drill holes, pulled to forward limit to ream holes. Accurate to 0.0005 in., these holes locate work in all subsequent fixtures. Rate is 86 per hour

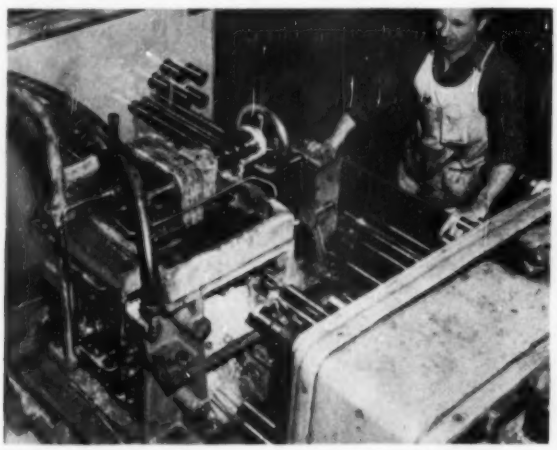


STRADDLE MILL machines center plate on top and sides, two mounting pads on the base, three surfaces on that large protruding boss, and cleans off a gate on the vertical plate at left end of base. Pneumatic fixture brings four clamps to hold piece on four corner pads after it is located on pins., Pin is pushed up against center of underside of piece by spring, then clamped in place by lockscrew (handwheel at center of fixture). This center support prevents deflection of centerplate which is being milled over three large surfaces at once. Milled surfaces are held to 0.005 in.

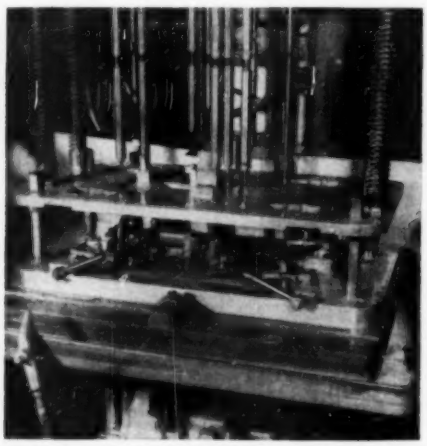


BOX FIXTURE holds two pieces. To support center plate from left as it is drilled from right, pressure pads are advanced by hydraulic pressure from piston at top of fixture. Hydraulic arrangement provides equal pressure on pads on both points. Ratchet in handle that operates piston slips as soon as pressure overcomes adjustable tension of spring behind ratchet. This ratchet prevents distorting center plate by overtravel of pads intended to protect it

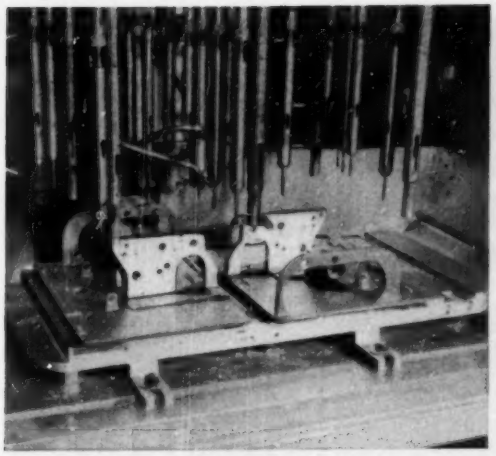
MULTI-DRILLING



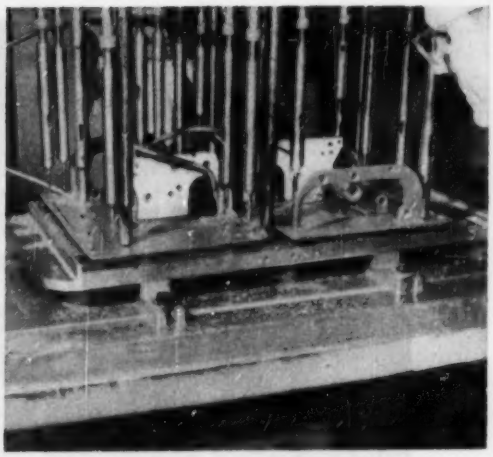
PART IS CYCLED four times in box fixture. It is mounted successively in top and bottom positions. Machine cycles once with fixture in forward position, then slides on ways to rear position (shown above) and drillheads advance again. This adds up to 57 drilling, reaming, countersinking, and counterboring operations on one machine



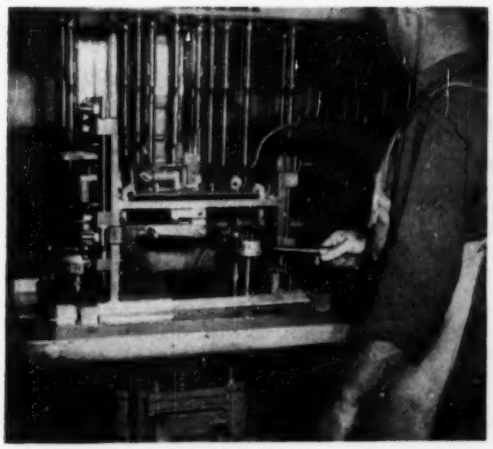
TWO VERTICAL MACHINES use a fixture like this for drilling and other operations. A single part fits over pins and is held against pressure pads by cam-operated clamps locked by hand. Bushing plate has openings to clear projections on part until it rests on pads on base of fixture. Drillhead continues compressing springs on rods supporting bushing plate. These springs strip bushing plate from drills on return stroke



NO CLAMPING IS NEEDED in this tapping fixture. Two parts are placed (first left then right) over the locating pins in fixture base. As tapping head descends six spring-loaded locking rods make contact with base of parts, holding them firmly against fixture plate. Springs hold parts until taps have cleared work

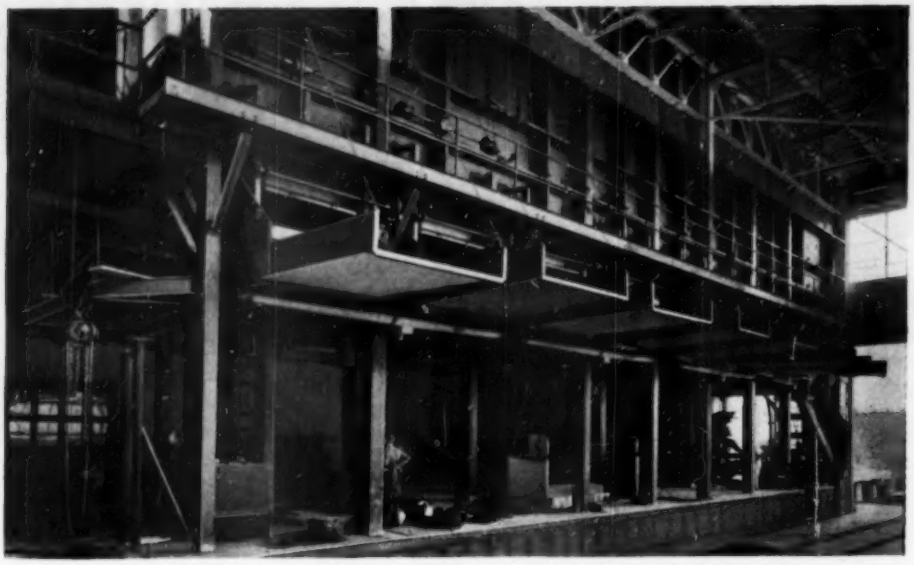


FIXTURES *continued*



WARMING TO THEIR WORK, the fifth Natco machine is tooled to hold three parts at once. First on the left side, then the top, then the right side of the fixture, a total of 22 holes is tapped. In this way the relatively few holes that must be tapped in the projections can be tied in with additional tapping in the base of the part, getting more work out of a single machine. A single cam-action lever for each position clamps the part over locating pins. Production is 68 per hour

FINISH REAMING of 16 holes to 0.0005 in. requires an especially sturdy fixture to maintain alignment. Bushing plates are held in fixed positions and part is located over pins and clamped against pads by three cam-action levers



Chip-handling installation consists of nine overhead bins served by four Hapman pipe conveyors. Chips move up into bins from hoppers in floor of dock. Heavy scrap is loaded from dock directly into trucks or cars in paved track well (Construction photo)

COMPACT CHIP-HANDLING SYSTEM

System gives quick gravity-loading of chips by one man, freedom from excess dust, and positive segregation of chips. Pipe conveyors save on over-all space requirements

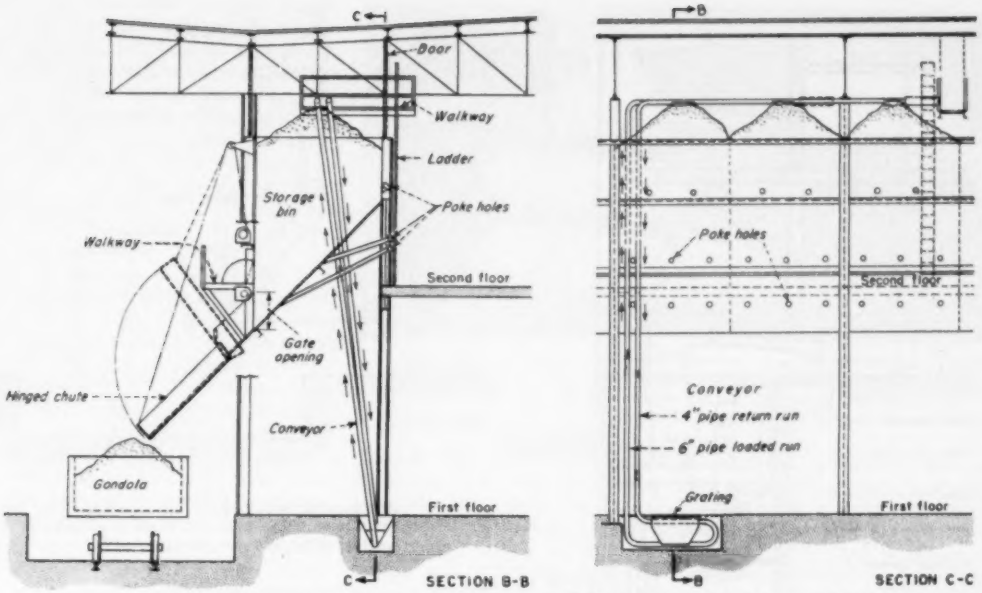
BY SIDNEY REIBEL Consultant on Equipment Design and Materials Handling, ALBERT KAHN ASSOCIATED ARCHITECTS & ENGINEERS, INC. DETROIT

MODERN methods steadily are replacing older ways of handling, storing, and disposing of metal turnings and chips. In any machine shop of appreciable size, handling is troublesome and labor costs are excessive when chips and turnings are handled manually and proper storage facilities are lacking. Proper handling, segregation, and storage of metal chips not only are necessary but also pay handsome dividends by lowering labor costs and increasing the sale value of scrap. It is natural, therefore, that the new engine-manufacturing shop for the Truck and Coach Division of General Motors Corporation at Pontiac, has a modern chip-handling system.

The chip-handling and storage area is adjacent to a depressed railroad track which is inside the building but close to an outside wall. The track area is paved so automobile trucks can be driven in for loading, and has docks on both sides. The dock on the chip-handling side is underneath the chip storage bins and is used to store heavy scrap in skid boxes. Fork trucks handle these boxes and dump them directly into auto trucks or railroad gondola cars. The area thus takes care of both chips and larger scrap.

Conveyors — Chips are brought to the storage area in small carts or in drums and are dumped into conveyor hoppers at first-floor level. The system has four conveyors and each handles only one material. This prevents possible mixing of materials as might happen if one conveyor handled different metals. To help operators avoid the mistake of dumping the wrong kind of chips into a conveyor, loading hoppers are well separated.

Before selecting the Hapman conveyor, several different schemes were tried. There were many drawbacks to either bucket elevators or skip hoists. Each takes up a lot of floor space. Both would

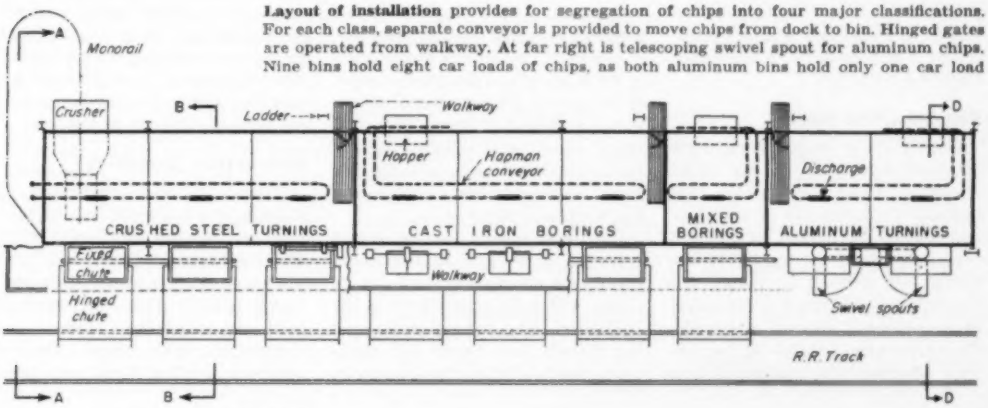


Overhead bins and equipment are installed in space 14 ft wide by 100 ft long and 35½ ft. in height between first floor and underside of roof trusses. Three small conveyor loading pits and crusher pit are below floor. Installation leaves first-floor area free from handling larger scrap below bins

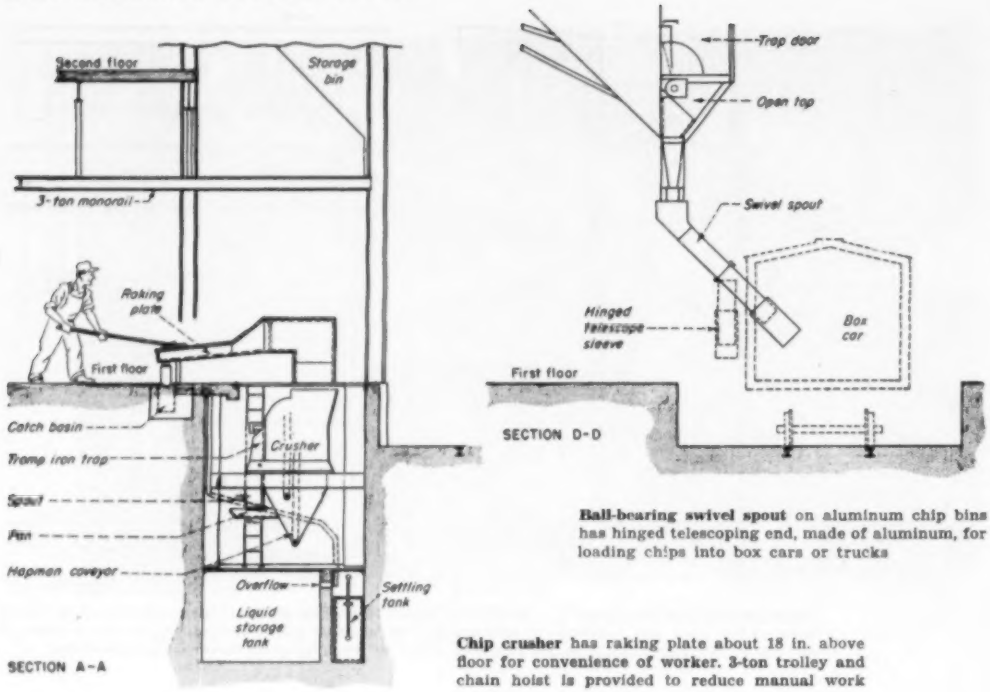
CUTS COSTS, BOOSTS SCRAP VALUE

project through the roof and require expensive housing. In the case of skip hoists, the projection would be as much as 30 ft. Further, the fanning action of elevator buckets or the dumping of a skip bucket both tend to raise a cloud of dust inside the casing and this is sure to escape at the loading hopper unless the most elaborate precautions are taken. In an older installation castiron dust had settled on a nearby roof to a depth of a couple of inches — a condition that would not to be tolerated in this instance.

The Hapman conveyor, originally developed for sludge removal from quench tanks, proved to be unusually well adapted to this application. The conveyor has round, synthetic rubber flights attached to



Layout of installation provides for segregation of chips into four major classifications. For each class, separate conveyor is provided to move chips from dock to bin. Hinged gates are operated from walkway. At far right is telescoping swivel spout for aluminum chips. Nine bins hold eight car loads of chips, as both aluminum bins hold only one car load



Ball-bearing swivel spout on aluminum chip bins has hinged telescoping end, made of aluminum, for loading chips into box cars or trucks

Chip crusher has raking plate about 18 in. above floor for convenience of worker. 3-ton trolley and chain hoist is provided to reduce manual work

a chain with sealed pins, the assembly operating inside standard steel pipe. The sealed-pin construction protects the chain joints so they can operate without harm although submerged in the material conveyed.

As joints are flexible, the chain can twist and turn in any direction on small radius bends. Thus a conveyor can bend to avoid obstructions, and operate in vertical, inclined, and horizontal planes. The sealed-chain and closed-pipe construction permit handling either wet or dry material without leakage of liquid or dust—a necessary feature for this job.

Require Little Space

One of the principal advantages of these conveyors is the small amount of space they take up. The distance from the top of the storage bins to the bottom of the roof trusses is only 3 ft 7 in., but it was not at all difficult to install the conveyors in this space while maintaining the full amount of storage. This arrangement allowed the regular building roof construction to be continued unchanged over this area.

In this installation the conveyors, except for cast-iron, have a 6-in. load pipe, and 4-in. return pipe. The finer particles of cast-iron require a closer fit between the rubber flights and pipe, therefore a 4-in. load pipe was selected for the cast-iron chip conveyor.

All conveyors load and discharge on horizontal runs. After loading they bend up to run more or less vertically, inclining toward the center line of the storage bins, and bending to avoid obstructions. Inclined runs go through the bottom of the bunker and the stored chips, as the smooth pipes do not interfere with the flow of material. The conveyor layout is schematic, the actual installation being slightly different in the position of risers and top horizontal return runs.

Conveyor speeds can be varied from 10 to 30 fpm. At maximum speed, the conveyors handle up to 3 cfm which is ample for the installation. The conveyors cannot be choked, feed being self regulated. Each is driven by a separate motor with push-button controls.

Drives are located at the head end of the conveyors above the bunkers. Walkways with ladders to the second floor provide access to the drives. Safety lock-out switches at these points prevent starting drive motors while they are being inspected or adjusted.

Conveyor loading hoppers are small as there is no objection to heaping a pile of chips above the floor. The top of each hopper (except the crusher hopper) is flush with the first floor and is covered by a grating that prevents large pieces from entering the conveyors. Return pipes run through the hoppers above the carrying runs, saving space so pits can be shallow.

Push-button Operation

Discharge from conveyors to storage bins is through plain openings in the top horizontal runs. There is no monkeying around with discharge gates because each conveyor handles only one kind of chip. An unskilled laborer can dump chips into a hopper, push the conveyor start button, and walk

away. The scrap foreman pushes the stop button if he sees by the indicator light that the conveyor is running after the hopper is empty.

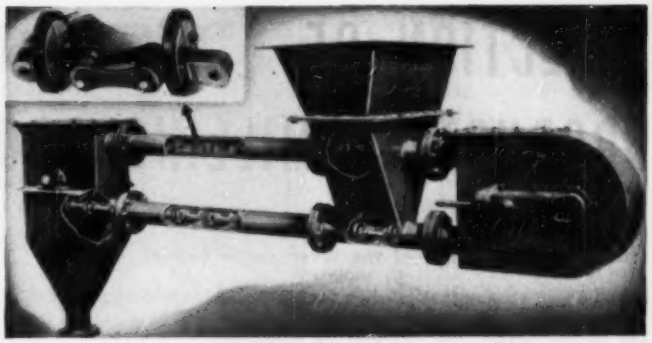
Crusher — Steel turnings in springy, tangled masses are very difficult to handle, store, or remove from storage. So a ring crusher with ¾-in. gratings was provided. Note the size of grating. It has been found that chips passing through ¾-in. gratings do not pack in bins, or, if they do, can be dislodged easily. But, when the grating is 1 in., chips have been known to stand in bins with a free vertical face as high as 15 to 18 ft and be very difficult to loosen up.

The crusher is driven by a 50-hp motor and the loading hood is extended so the raking plate is about 18 in. above the floor. This makes a better working level than the usual practice of having the plate on the floor. As the raking plate slants away from the crusher, some coolant drains out without entering the crusher. The raking plate gives the operator a chance to examine the turnings and remove large pieces of scrap and foreign material. Any chunks overlooked are automatically thrown out by the crusher. Thrown into the tramp-iron trap, they drop through a spout into a pan where they stay until removed. Chips that escape at at the same time can be pushed from the pan into the crusher discharge hopper.

The greater ease of handling and higher price obtained for crushed chips as compared with turnings make the crusher a profitable investment.

Storage Bins and Gates—Nine bins provide storage. All are the same size, with the ferrous bins holding approximately one car load each. Each storage bin has a large opening with a double rack and pinion vertical roller gate operated by a high-grade, self-locking worm-gear reducer. The ferrous bins have hinged chutes to load either auto trucks or railroad gondola cars. The chutes are raised and lowered by cables on drums connected to the same type of worm-gear reducer as the gates.

Hand cranking to open and close these large, heavy gates and chutes was considered too slow and laborious. On the other hand, separate motor drives for each of the sixteen drive units would be too expensive. A line shaft with clutches and chain drives seemed too clumsy and a source of danger from overloading if several units were connected to the drive shaft at one time.



Hapman conveyor has round synthetic rubber flights attached to chain with sealed pin. Chain joints are flexible and permit bends in any direction. Unit requires little space to operate

The method finally selected to operate these drives was to provide a single, portable, air-powered, reversible nut driver which the operator can carry from one point to another. He snaps the socket end of the nut driver on the squared shaft of the reducer and operates a gate or chute with plenty of speed and no effort. At the end of travel, the nut driver can stall without damage to itself or the equipment. It has a short length of hose that can be coupled to one of several air outlets located at convenient intervals in front of the bins.

A walkaway provides access to the operating mechanism of the gates and chutes. It is high enough for the operator to watch and regulate the loading operation.

Enclosures—All bins have enclosures extending to the roof to prevent metallic dust from getting out to settle over the area. Water sprays are provided to wet down the cast-iron chips but this is seldom required. A partition separates the aluminum chip bins from the others, preventing contamination of aluminum by iron or steel dust.

Chips sometimes pack in storage bins, and are difficult to dislodge. To take care of this possibility, poke holes are located at several levels in these bins. All poke holes are brought by pipes to convenient levels at the second floor. The high level can be reached from a movable platform. Trap doors in the operating walkway also provide access through the gates to chips that may jam at the front of the bins.

Miscellaneous—Drip gutters under the gates and a sump for the aluminum-chip-bin spouts catch any drip of coolant or moisture, and allow it to drain back to the storage tank in the crusher pit. Sludge that accumulates settles in a sludge bucket that can be removed and emptied. The overflow goes into the tank and can be pumped to tank trucks which haul it away to a dump. The pump is not shown on the drawings. Coolant cannot be drained into a storm or sanitary sewer as it is classed as an industrial waste.

A service monorail track with a 3-ton trolley and chain hoist are located above the crusher. They can be used for crusher repairs or grating replacement, to dump containers of steel turnings onto the raking plate, or to remove the sludge bucket from the pit for emptying.

The chip handling and storage system was designed, under the supervision of the writer, by Albert Kahn Associated Architects and Engineers, who were the architects for the entire building project.

SELECTION OF PRODUCTION MILLING PROCESSES—I

Production rate is one of the seven major factors in finding an economical solution for a production milling problem. The author details the formulas by which production rate is calculated. . . . Then he proceeds with discussion of the first and simplest method to be considered: single-piece milling

BY MARIO MARTELLOTTI, THE CINCINNATI MILLING MACHINE CO.

PRODUCTION MILLING is the application of milling equipment to manufacture of large and small quantities of parts, with the objective of obtaining a high rate of production and high dimensional accuracy, which will permit interchangeability of parts at minimum unit cost.

To arrive at an economical solution for any production job, a number of factors must be appraised or estimated. These include: method of milling; selection of machine, fixtures and cutters in relation to quantity of parts to be machined; required rate of production; size and shape of the parts; physical properties of work material, and nature of milling operation.

A characteristic feature of production milling is the fact that milling equipment for such work may be in use for long periods of time on the same operation. Furthermore, semi-automatic or full-automatic operation of both fixture and machine is often necessary to reduce operator fatigue and meet the required production rate.

Production Rate

The production rate (number of pieces milled per 60-min. hour) obtainable with any milling equipment depends upon the time per piece and the productive efficiency. On the average, efficiency varies between 80 and 85% per hour, depending upon shop conditions. This results in a productive hour of between 48 and 51 min.

In general, the actual production rate of a machine and the time per piece can be expressed by:

$$P_R = \frac{60\ E}{t_p} \quad \text{or} \quad t_p = \frac{60\ E}{P_R}$$

P_R = production rate, pcs per hr
E = productive efficiency
t_p = time per piece, min.

In regular operation of a milling machine, t_p is equal to the sum of the prorated time per piece of the setup time, the downtime required to change cutters for resharpening, and the machine cycle time t_c. Setup time and down-time indicate direct loss in production.

MACHINE CYCLE TIME t_c is the time elapsed from the instant a part of workpiece is placed in the fixture, or otherwise clamped to the machine table, to the instant in which it is removed after completing the operation.

SETUP TIME t_s is the time required to set the cutters and fixtures on the machine and in proper alignment, and to check the operation of the machine so that the parts are milled at the required rate and to the specific finish and accuracy. If T_s is the total setup time and N is the number of parts milled in a particular setup, then the prorated setup time t_s per piece is:

$$t_s = \frac{T_s}{N}$$

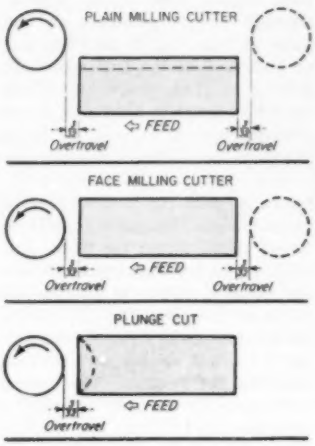


Fig. 1 . . Schematic diagram of overtravel in milling operations with plain and face milling cutters

DOWN TIME t_d is the time during which the machine is idle while changing cutters for resharpening.

The frequency of down-time for changing cutters depends on the cutter life. Accordingly, the selection of the cutter and cutter speed should be made with the view of obtaining maximum cutter life between resharpening periods.

Physical properties of the work material should also be considered in relation to cutter life. Changes in these properties may be necessary in order to improve the machinability of the work material and increase cutter life.

Machine down-time may also be caused by accidental breakdown. This will affect the production rate of a machine but, due to its nature, is not generally considered in establishing the production rate of

Abstracted from "A Treatise on Milling and Milling Machines," which will be published at an early date.

Fig. 2 .. Single-piece milling is the simplest method. Here a forging is clamped in a vise applied to the table of a knee-type manufacturing milling machine

any specific type of equipment.

If T_d indicates the total down-time required to change milling cutters, and N_s is the number of pieces milled between resharpenings, then the prorated down-time per piece will be:

$$t_d = \frac{T_d}{N_s}$$

In order to obtain a realistic estimate of the productivity of any particular milling equipment, the setup time and down-time of the machine should be added to the machine cycle time t_c. Hence, the time per piece t_p is:

$$t_p = t_c + \frac{T_s}{N} + \frac{T_d}{N_s}$$

Substituting this expression for t_p in the first formula:

$$P_R = \frac{60\ E}{t_c + \frac{T_s}{N} + \frac{T_d}{N_s}}$$

Setup time and down-time can be estimated from the type of equipment selected (cutter, fixture and machine). When the cutter life T in min. and the time per piece t_c per machine cycle are known, the number of parts milled between cutter resharpenings can be obtained as follows:

$$N_s = \frac{t_c}{T}$$

The machine cycle time includes the milling time, idle cycle time and handling time.

MILLING TIME t_m is made up of the time used in actual milling of a workpiece at the selected feed and speed rates, and the time required for the approach and the overtravel.

The overtravel is the combined travel at the feed rate, before and after the cutter engagement with the workpiece, allowing for possible variations in the length and thickness of the stock to be removed in the parts or pieces to be milled.

A frequently used value for overtravel is 3/16 in., equally divided between the beginning and the end of the cut, Fig. 1. A value of the overtravel of less than 3/16 in. is used in cases where the parts to be milled are closely dimensioned; and a value of greater than 3/16 in. is used when processing cast or forged parts in which considerable variation in dimensions may be expected.

Time for overtravel is actually a part of the idle cycle time. But since it is present in all milling operations, and is associated with the feed, the time for the overtravel is preferably combined with the milling time.

To determine the milling time:

$$t_m = \frac{L_c + A + O}{F}$$

where:

t_m = milling time per piece, min.
L_c = length of cut, in.
A = cutter approach, in.
O = overtravel, in.
F = feed rate, ipm

From the above formula, it can be seen that, for given values of the length of cut, approach and overtravel, the milling time decreases as the feed rate is increased.

IDLE CYCLE TIME t_i is the time spent in placing the workpiece near the cutter and, after milling, in returning either the workpiece or the cutter to the starting position. This is usually done by rapid traversing the machine table or the cutter head. Idle cycle time consists of:

T_1 = rapid traverse to advance the workpiece to the cutter, or vice versa, min.
T_2 = rapid traverse to return the workpiece or the cutter to the starting position, min.

$$t_i = T_1 + T_2$$

The number of steps in the cycle, as well as the amount of time required for each step, will vary in different applications.

HANDLING TIME t_h consists principally of the time, within the operating cycle, spent by the machine operator in loading and unloading the fixture and handling the parts being milled. It generally may consist of time elements:

T_0 = pick up a part and place it in the fixture, min.
T_4 = clamp part in fixture, min.
T_5 = index part, min.
T_6 = start cycle of operation, min.
T_7 = unclamp part, min.
T_8 = remove part and lay aside, min.
T_9 = brush chips to clean the fixture, min.

The total handling time in minutes is therefore:

$$t_h = T_0 + T_4 + T_5 + T_6 + T_7 + T_8 + T_9$$

Hence, the machine cycle time per piece is:

$$t_c = t_m + t_i + t_h$$

where:

t_c = total machine cycle time per piece, min.
t_m = milling time per piece min.
t_i = total idle cycle time per piece, min.
t_h = total handling time per piece, min.

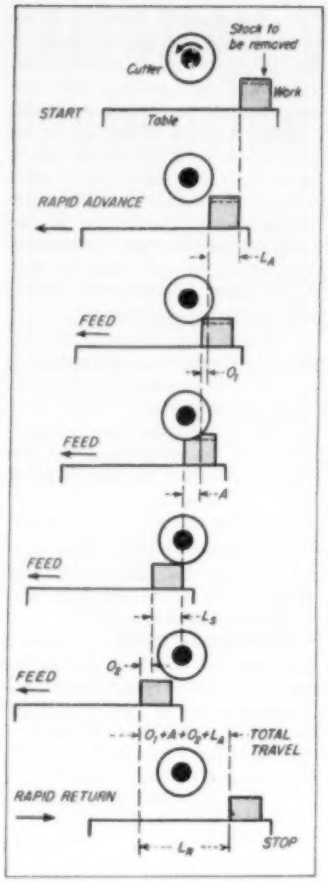


Fig. 3 . . Diagram showing successive relationships between the cutter and workpiece in single-piece milling

Production rate of any given milling equipment, based only on the machine cycle time t_c is:

$$P_R = \frac{60\ E}{t_c}$$

The productive part of any machine cycle is therefore the time in which the milling cutter is actually cutting. Any part of the cycle in which the milling cutter is idle (not cutting) reduces the production rate.

The ideal condition would be obtained in an application where the milling cutter is cutting continuously, so that the time t_i and t_h is not chargeable to the cycle time. It is possible to approach ideal conditions in some applications. In the large majority of production milling jobs, however, the milling method employed will largely determine the value of the cycle time and what part of the cycle time is actual milling time.

Milling Methods

The manner in which the parts to be milled are located relative to the cutter in performing a milling operation is known as the method of milling.

When choosing the method of milling to use in a particular production milling job, a number of methods and their combinations should be analyzed before arriving at the solution which will give the most satisfactory over-all performance. Some of the most generally used methods of milling are: single-piece milling, string milling, abreast milling, progressive milling, box milling, reciprocal milling, transfer base and index milling, rotary milling, and their combinations.

Single-Piece Milling

The simplest and most easily applied method of milling is that in which one part, held in a fixture or directly on the machine table, is milled during each machine cycle. This is known as single-piece milling, Fig. 2.

The machine operator places the part in the fixture or on the machine table, and clamps it in place. The table is then advanced at a rapid rate to locate the workpiece in position for milling. Here, the rate of table travel is usually changed automatically to the feeding rate by means of trip dogs. When milling has been completed, the workpiece is returned to the starting position, where it is removed and a new piece put in its place. The cycle is then repeated. Hence, loading and unloading of the workpiece are done on the same side of the machine.

Successive relationships between the cutter and workpiece during a cycle are shown diagrammatically in Fig. 3, which illustrates peripheral milling. A similar relationship exists in face milling.

The loading and unloading position of the fixture is usually selected at a minimum safe distance L_s from the cutter, so as to allow the operator to unload and load without danger of touching the cutter, which may be running.

When the machine cycle is started, the machine table, because of this condition, travels the distance L_s at the rapid traverse rate and shifts into feed before the workpiece touches the cutter. The feeding continues through the overtravel O_1, approach A, length of cut L_c, and overtravel O_2. The table then is returned rapidly to the loading position. The distance traveled at the rapid rate in the return stroke of the table is then equal to:

$$L_R = A + O + L_c + L_A$$

where:

$$O = O_1 + O_2$$

The cycle is graphically represented as shown in Fig. 4. Within a cycle, the length of table travel at the feed and rapid traverse rates and the time required are as follows:

Milling time for the length $A + L_c + O$ at the feed rate of F in. per min.:

$$t_m = \frac{A + L_c + O}{F}$$

Idle cycle time for the length $A + L_c + O + 2L_A$ at the rapid rate of R in. per min.:

$$t_i = \frac{A + L_c + O + 2L_A}{R}$$

When the handling time t_h is added to t_m and t_i, the result is the cycle time per piece t_c.

Applications of this method of milling are shown in the following examples:

The equipment, Fig. 2, consists of an automatic knee-type manufacturing milling machine, with trip dogs selectively controlling the rate of the table movement and re-

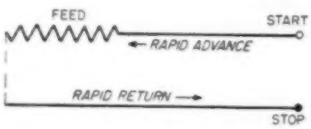


Fig. 4 . . Cycle of operation used in single-piece milling of forged parts with the equipment shown in Fig. 2

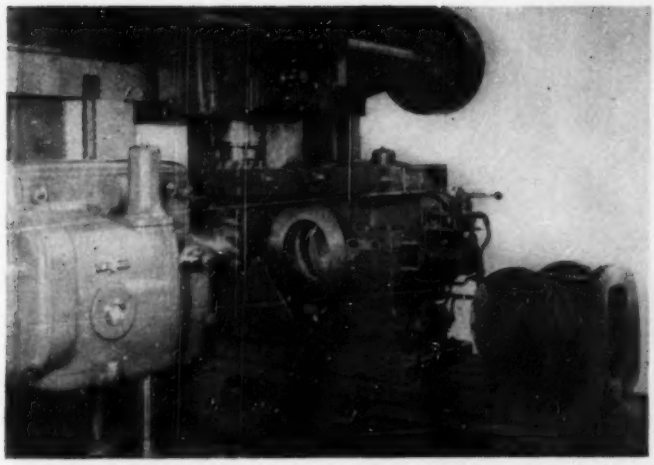


Fig. 5 . . Single-piece milling of a large valve body on a semi-special manufacturing milling machine

versal. The fixture is a modified-jaw swivel vise which locates and holds the parts, one at a time, in proper relationship with respect to the cutter during the milling operation.

In this operation, the sides of the bosses are milled and the top surfaces form milled by a gang of high-speed-steel, arbor-type milling cutters, one of which is provided with a chamfer and operating at a cutting speed of approximately 40 fpm. At a feed rate of 2½ ipm, the cycle time t_c or time per piece is 1.65 min., and the production rate per 51-min. hr. is 31 pcs.

In this application, if the cutter is not raised when the table is returned to the loading position, the milled surface may be marred or marked by contact with the cutter teeth. To avoid this condition, especially when a good surface finish is required, a machine may be selected so that in the cycle of operation, the machine spindle is stopped, raised or retracted at the end of the milling part of the cycle, or the workpiece is unloaded before returning the table to starting position. In the latter case, after completing the cut, the table rapid traverses to a stop. The piece is removed from the fixture and the table is returned to the starting position for reloading.

This cycle may also fit into a general manufacturing arrangement in which the machine is located in a conveyor line, so that the milled piece is delivered to the conveyor with a minimum of handling time. Thus, the fixture is loaded and unloaded on opposite sides of the cutter, and the operator changes his position accordingly.

With this table cycle, the table travel is increased by the additional amount L_{a_1} which the table advances after milling. The milling time will be the same as in the case of Fig. 4, but the idle cycle time has been increased due to an increase in the length traveled at the rapid-traverse rate, as follows:

Idle cycle time for length $A + O + L_o + 2(L_a + L_{a_1})$ at the rapid rate of R in. per min.

$$t_i = \frac{A + O + L_o + 2(L_a + L_{a_1})}{R}$$

at the rapid rate of R in. per min.:

In addition, the handling time t_h would be increased because the time T_s to start the table would appear twice in each cycle.

It is sometimes possible to offset this increase by reducing the milling time t_m through the use of a variable feed attachment. At other times it may be more convenient to use the cycle of Fig. 4, but to retract the spindles as in the following example:

In the application shown in Fig. 5, a semi-special manufacturing milling machine of the rail-type is used to mill three surfaces simultaneously on a large valve body. The fixture is loaded when the table is at the extreme right-hand position. The table is rapid-advanced, and is automatically tripped into feed when the workpiece nears the cutters. At the completion of the milling operation, the three spindles are retracted so cutters clear the work.

Another instalment on production milling will appear in the July 24 number.

Tips FOR TOP SHOP MEN

346 Your manufacturing engineers should have just one job: to make your present methods obsolete. The more they succeed, the greater is your productivity.

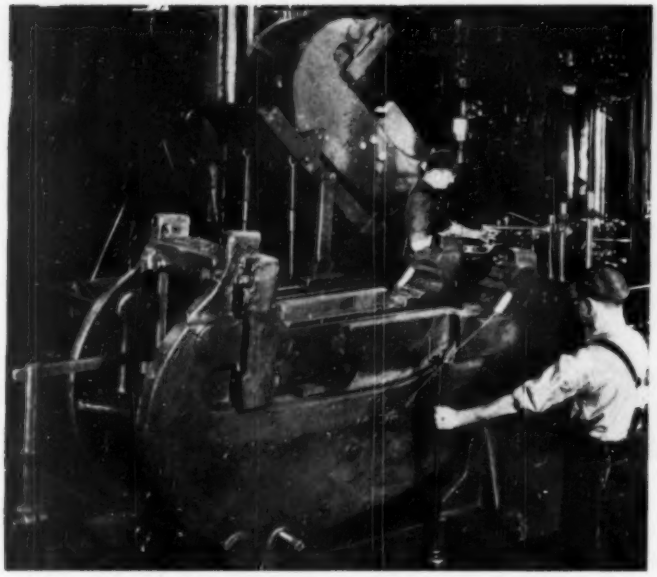
347 An invisible boss presides over every collective bargaining session. He is not labor, management, or government—but is the customer, who exercises power of selection over your company's products.

348 Two of management's most important words are "know" and "no." If you're strong on the first, you seldom hear the second.

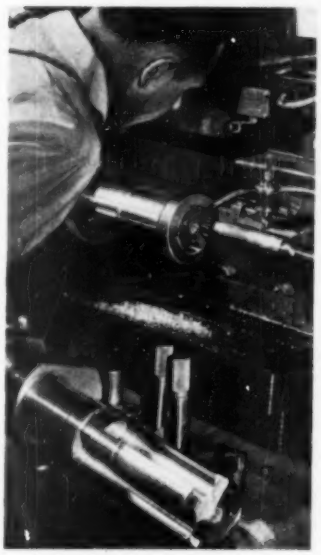
PRODUCTION TOOLING SOLVES MACHINING PROBLEMS

BY RUPERT LE GRAND
ASSOCIATE EDITOR

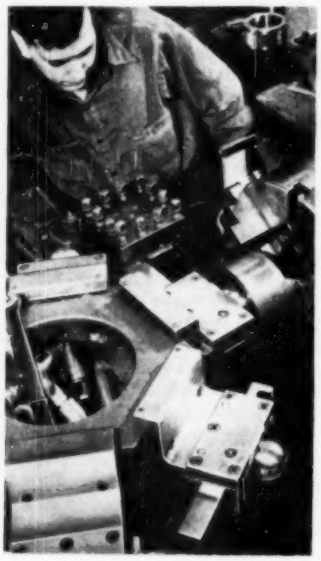
IN Hastings, Mich., the E. W. Bliss Co. operates a production-type plant, which has two functions: First, gap-frame, inclinable, and straight-side presses up to 300-tons capacity are produced in large lots. Second, interchangable replacement parts are made for Bliss presses in many sizes. The combination produces enough volume to permit use of production-type tooling and special setups on many operations. Hence, the shop management has devised a number of methods, fixtures and tools that reduce costs and operations and improve part quality, even though not constantly in use in all cases. The basic machining problems involved are present elsewhere, and for this reason the solutions described should suggest potential savings to other plants.



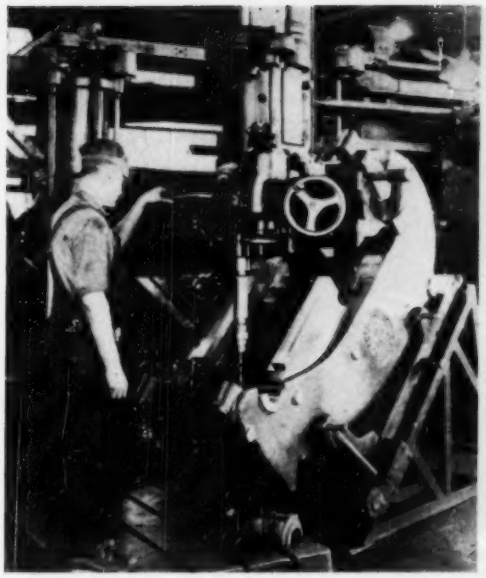
Layout and machining fixture. Foreground: centers of the bed opening and crankshaft journals are set to horizontal crossbar supported on center pilots. Fixture is located on surface plate by key. Background: Fixture is placed on Ingersoll planer miller. Bed and slide surfaces are milled with fixture horizontal; bearing cap seats in raised position



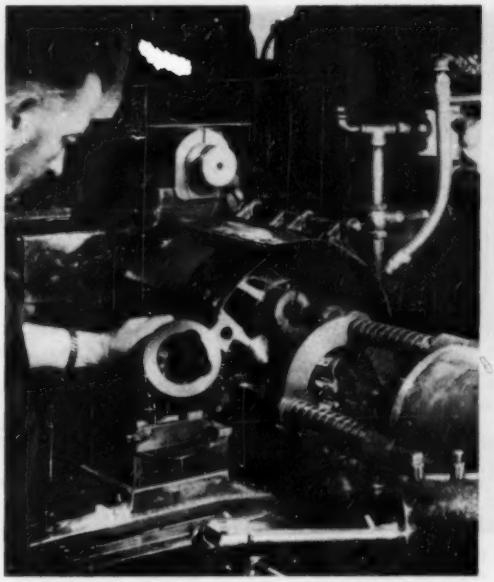
Half-round grooves in crankshaft are reamed. A guide for boring bar prevents tool from springing away from the cut. To set tool, a ring gage is clamped on work, and tool brought into light contact with a half-round opening in gage. Passes are made with 4- and 12-blade tools



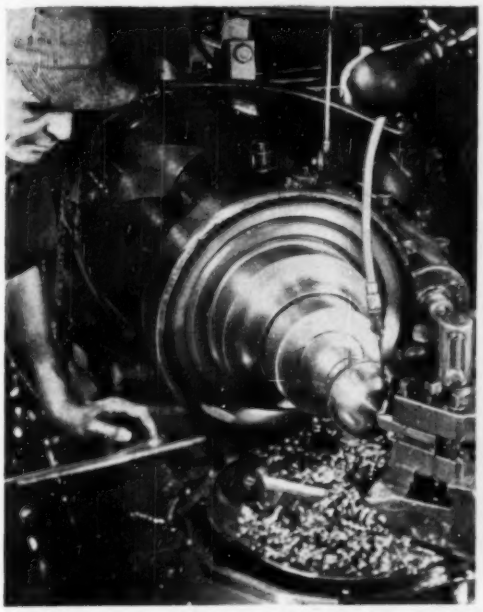
Ball seats for press connections are turned with toolbit set into a circular plate in ball-like protuberance on turret fixture. This plate is caused to pivot by a feed bar that is hooked over a pin in the carriage toolpost. Several fixtures are needed for various ball seats



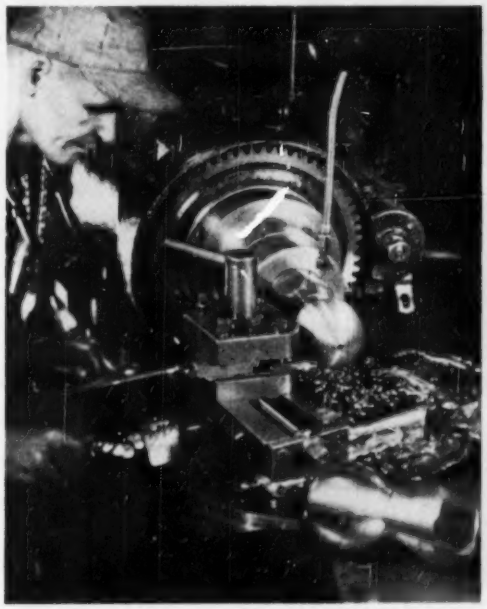
Third application for press frame fixture. With the fixture laid onto an angle support, the screw holes for the bearing-cap screws are drilled quickly by a radial drill. Frame is for a 60-ton inclinable press. Good crane service speeds the work at planer and radial drill

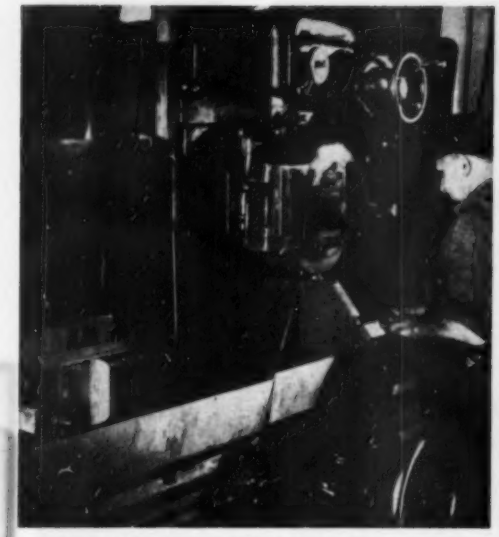


Holes are drilled off center in a clutch collar by a Hoefer 4-spindle drillhead mounted at the No. 1 position of a turret lathe. Pilots on the drillhead engage bushings on the chuck. Thus, the head rotates with the work, but drives drills through planetary gearing



Ball OD for press-connection screws is turned with a special lathe carriage. This device is pivoted at a point on the spindle axis, as projected, and is rotated by a system of gearing connected to the carriage handwheel. Adjustment for ball radius (up to 6 in. has been turned successfully) is obtained with the carriage slide. Roughing and finishing cuts are made by tools placed on opposite sides of the toolpost. By turning the ball OD with this fixture, no scraping is required to obtain a satisfactory bearing with the ball seat

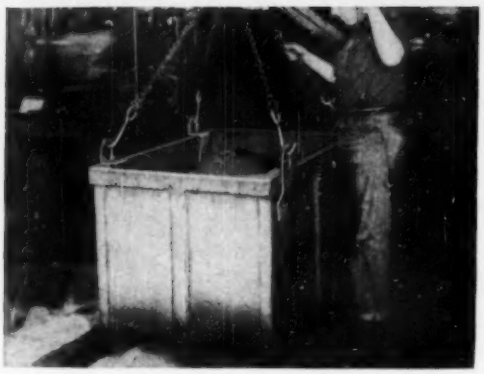




Grinding gib ways on a press slide to the proper included angle is assured by the wheel dressing arrangement (right). Two diamond dressers are mounted on fixed-position slides, and these are advanced alternately to dress the concave V in the wheel face. The work fixture (left) locates the press slide by one gib way resting in a channel and by a ground face butting against a stop

An indexing table permits milling the cored V's in Meehanite gibs at the rate of 20 pcs per hr. Sides and bottom are milled in previous operations, so that parts can be accurately clamped in the vises. While a cut is in progress at one vise, the operator removes and replaces pieces at the other. Gibs from 12 to 22 in. long are clampable in a single vise. Longer gibs are held by two vises

Honing of crankshaft bearings saves about 6 hr per press, as compared to scraping. After assembling the bearing caps, the operator on the left reams the bearings, leaving 0.006-0.010 in. for honing. Then, the operator on the right inserts an expansion-type honing tool and connects an air motor to it. Honing requires only a few minutes



Underfloor chip baskets save considerable effort. When a basket is full, a chain sling is hooked onto the four lifting eyes. Now a basket is taken to the yard, and stored until a gondola-car load is ready. At this point, a fork-lift truck picks up the basket by bottom openings and dumps the chips into the car

Components of a complex steel mold and the wax pattern produced by it→

Investment Castings

DEPEND ON GOOD PATTERN TOOLING

By RAWSON L. WOOD, President, Arwood Precision Castings Corp.
and DAVIDLEE VON LUDWIG, Consultant, Director of Research, Vacuum Casting Corp.

Practical production of close-tolerance, often intricate, castings by the "lost wax" technique depends on the quality of the expendable patterns used. These patterns, usually wax, sometimes plastic, and infrequently frozen mercury, must be produced in a mold or die. The design of the mold is critical in a process that requires utmost attention to detail and technical ability at every step. The mold must be readily dismantled and the pattern withdrawn without damage or distortion to the latter. Care is required in location of cores, runners and parting lines. Selection of low-melting point materials or machined-steel mold components depends on circumstances. These are some of the aspects of pattern tooling that the authors discuss from considerable experience and illustrate through examples of good and bad practice.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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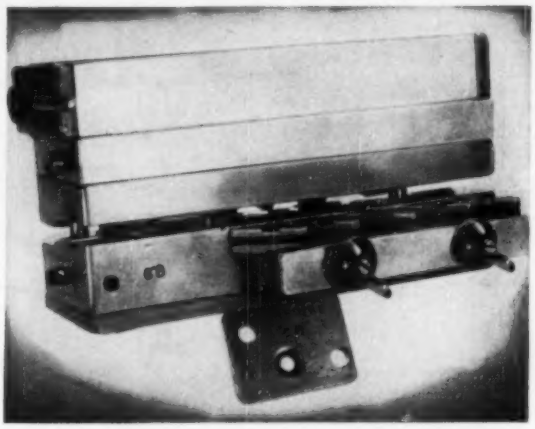
Master patterns are made of steel, and they must incorporate precisely determined allowances for shrinkage of the actual investment casting. Excellent finish is needed



Five-cavity mold produces wax patterns for the investment process. Involved curves in the product required use of a cam mechanism that insures clearance of all parting lines without distortion of any pattern

What Investment Casting Involves

INVESTMENT CASTING differs from other casting processes in two respects: First, expendable patterns are used to form the required cavities in heated ceramic or plaster molds. Second, the rules of best metallurgical and founding practice must be followed rigidly in order to produce parts of uniform physical properties and controlled dimensional accuracy. By precise control of auxiliary details, it is possible to maintain metallurgical and dimensional specifications which cannot both be duplicated by normal commercial casting methods.

Operations essential to investment casting are:

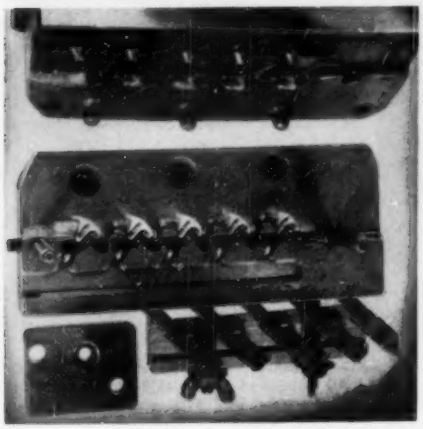
1. Designing and producing a suitable master pattern from which soft-metal pattern dies are made, or designing and laying out a model for a steel pattern die.
2. Making the soft metal mold or steel die.
3. Making the disposable patterns of wax, polystyrene plastic or a low-melting metal.
4. Gating, cleaning, clustering and otherwise preparing the patterns for investment.
5. Preparing and applying the investment to the patterns.
6. Heating the investment to remove the patterns.
7. Firing to set the investment and remove all water.
8. Melting and alloying metal for the part.
9. Casting the metal into the fired, hot investment molds under conditions of accurate thermal control.
10. Removing the castings from the investment and finishing each part.
11. Inspection of rough castings.
12. Finishing and machining details not possible to cast to desired tolerances.
13. Final inspection.

Production of uniformly precise castings is possible only by compensating for the combined effects of shrinkages encountered in the several materials involved. These variables are numerous and have cumulative values which range from less than 1% to more than 4% in different materials. Common variables which enter into the process are partially listed. Many of these variables are subject to effective control when production standards are closely maintained.

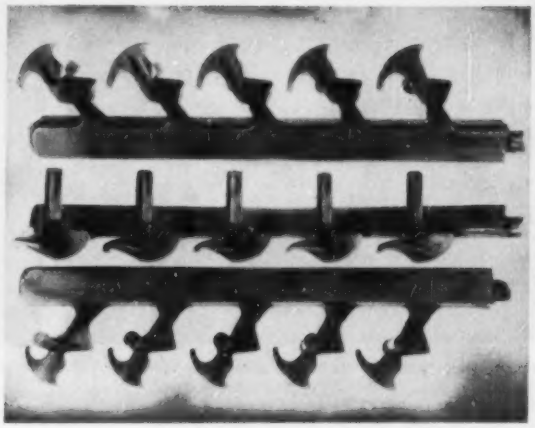
Where Accuracy Must Start

The accuracy with which any casting can be produced is determined during the stages of design and production of the pattern dies. The master pattern or die-cavity dimensions must often be calculated to tolerances in tenths of thousandths. Simultaneously, precise excesses in all dimensions must be added to compensate for anticipated cumulative shrinkage of the casting.

for an Industrial Sewing Machine •



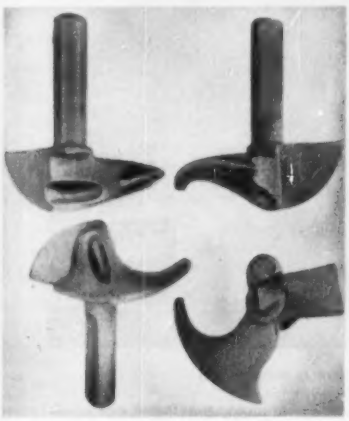
Parting lines in the mold faces are worked out to avoid sharp corners or small projections. In this view of the opened mold, the cores in the drag half have been retracted



Three gangs of wax patterns show the various details of the rotary needle and the method of gating the waxes. A strong assembly like this is easily handled without damage or need for repair

Investment of wax patterns consists of placing them in flasks and pouring in a ceramic material. Vibration under vacuum expels air

Rough investment castings (there were 80 pcs connected by gates and risers) are produced after firing the investments to remove wax



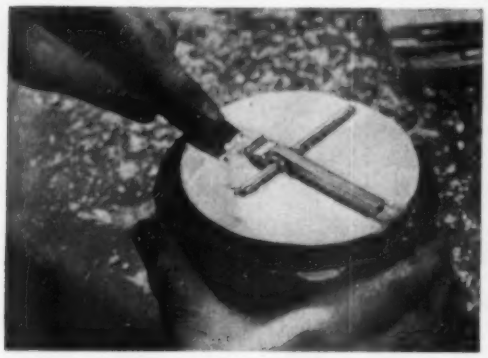
Cleaned castings have the point ground and polished, and case carburized. An SAE 3120 casting costs 60% of machined 1020 forging

The master pattern for a soft-metal mold or the actual steel die are therefore the most important determinants of the precision which will be commercially producible in any investment—cast part. The casting can be no more correct in shape or size than the pattern die. Finish of the casting will in all cases be rougher than the finish imparted to the pattern die. Therefore, all die surfaces must be entirely free of scratches, pits or other accidental defects.

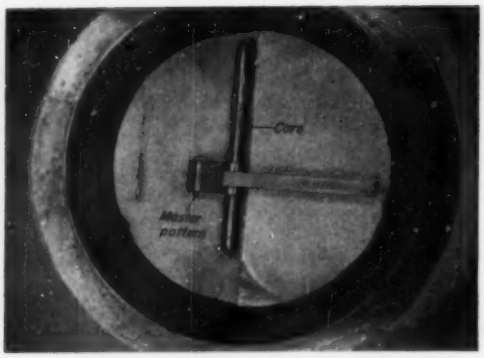
Factors that must be observed in the production of master patterns, soft metal molds and steel dies are:

The most common disposable pattern materials are either wax or plastic. Attempts to use metal-alloy patterns have not met with commercial acceptance. Of the many metal-pattern materials tried, frozen mercury has shown the most promise. This is attributed to the absence of solidification shrinkage. However, commercial applications of the frozen-mercury technique have so far been inhibited by the complications encountered in

• Steps in Making a Soft-Metal Mold



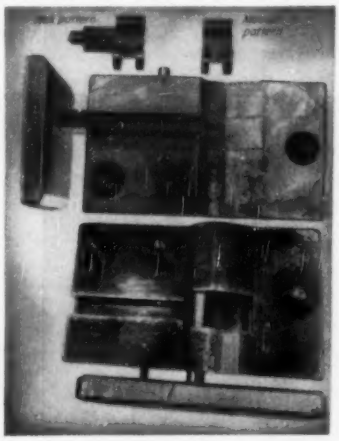
Parting-line location determines mold life and pattern accuracy. A steel master with two cores and draw bars is embedded in plaster, which is being scraped to the desired parting line



Embedded master is baked to remove moisture from the plaster, and placed at bottom of a steel flask. Molten Cerrotru is poured into the flask and hydraulic pressure applied to steel plug

Care is required to remove the compressed plaster from first half of the soft-metal mold. Parting line of mold is milled to within a few thousandths of the exact centerline

Ready to receive wax, the mold is closed and draw plates for the two cores have been applied. A sturdy mold with well-finished details is essential for production use



Parting of the mold is done by withdrawing the cores (shown here partially retracted) and separating the halves. The master and wax patterns are also illustrated

attempting to operate at temperatures as low as —130 F, which is normal for process.

It is obviously difficult to hold such low temperatures when handling the frozen patterns and special investment mixtures. The design of dies, jigs and other fixtures is complicated, and performance of the best tooling is subject to considerable variation at such temperatures. Thus, the theoretical gains possible with mercury are offset by the practical difficulties encountered. Besides, it is important to note that the total possible gain in tolerance of the part is in the order of less than 0.001 in. per in., when contrasted with the accuracy of investment-mold cavities obtained through the correct use of wax patterns. And variables in casting will affect the part tolerance anyway.

No absolute rules can be laid down for determining when a pattern die is to be of steel or a soft metal. Usually dies for producing plastic patterns are steel, to withstand the long runs contemplated. For a wax-pattern mold several considerations must be studied in selecting the die material.

For short production runs involving 1,000 or fewer wax patterns, steel dies are seldom justi-

fied. Usually, but not always, it is cheaper to prepare a positive master pattern and use it to form the negative die cavity in soft metal than it is to machine a negative cavity in steel. Under normal conditions involving relatively simple part designs, the demarcation line between a soft metal and a steel mold usually is about 10,000 patterns. Above 10,000 patterns, construction of a steel mold is generally required, particularly for prolonged operation to very close tolerances with minimum variation.

In designing a pattern die for producing large quantities of patterns for small, reasonably simple casting, which may be parted in a single plane, multiple-cavity molds are often made in soft metal. If the casting involves contours where form is more important than exact dimensional accuracy, a series of master patterns can be made sufficient to form all cavities required simultaneously. These masters will be functional duplicates, but necessarily will vary in finish and absolute size. If sufficient cavities are incorporated in soft-metal molds, they may be used to produce in excess of 100,000 patterns.

To make a multiple-cavity mold in soft metal where very precise dimensional details are required, only one master pattern can be used. This single master is used to form the required number of individual cavities, which are assembled into a gang mold block and gated from a common runner. When such cavities are formed in Cerrotru matrix, the wax patterns reproduced are indistinguishable as well as functional duplicates.

The Cerrotru alloy is able closely to reproduce exact details and tolerances, since its shrinkage factor is only 0.0005 in. per in. A newer alloy, Cerrocast, has even less shrinkage, 0.0001 in. per in., and remains mushy over the temperature range of 281-338 F. while pressure is applied, and is somewhat harder to

Variables Affecting Calculation of Pattern Tools

1. *Shrinkage of the metal to be used in producing a soft metal mold:*

(a) Pouring temperature of the soft-metal alloy.
(b) Effective pressure applied to the solidifying mold sections.
(c) Duration of applied pressure.
(d) Accuracy of alloy composition used to form the mold.

2. *Shrinkage of the wax plastic or metal patterns during solidification in the mold and after ejection therefrom:*

(a) Temperature of the pattern mold should be standardized.
(b) Injection pressure must be controlled.
(c) Time of "dwell" under pressure must be standardized.
(d) Pattern temperature upon ejection must be uniform.
(e) Pattern temperature at moment of investment must be controlled.
(f) Ejection technique must be uniform.
(g) Gating and ganging methods must be free of stress conditions.
(h) Finishing and clustering techniques must be controlled.

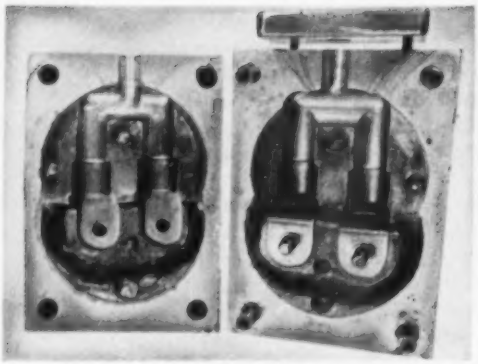
3. *Shrinkages and expansion factors encountered in setting and firing of investment material used to make the casting mold:*

(a) Proportion of investment components must be uniform.
(b) Ratio of investment powder to water of other fluids standardized.
(c) Temperature of fluid investment during application controlled.
(d) Temperature of the investment during setting up.
(e) Rate of heating to extract the patterns.
(f) Cycle of firing to expel all moisture and bring to casting heat.
(g) Cycle of cooling, when necessary, to correct casting temperature.

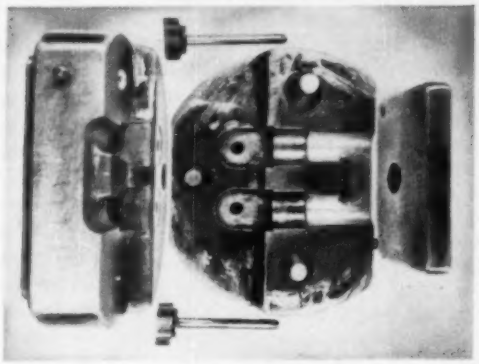
4. *Shrinkages encountered in solidification and cooling of the metal in the mold after casting:*

(a) Pouring temperature of the metal.
(b) Mold cavity temperatures during pouring and solidification.
(c) Exact composition of the alloy being cast.
(d) Exact degree of freedom from gas, slag, dross, etc.
(e) True fluidity of the alloy being cast.
(f) Degree of activity between metal and investment mold.
(g) Control of inhibitors when used in the mold.
(h) Average section sizes and proportions of metal to cores.
(i) Casting methods employed: (1 speed of rotation when centrifuged; (2) absolute pressure differential when pressure or suction cast; (3) hydrostatic head when static cast; (4) rate of pour; (5) permeability of the investment mold.

All of these factors may be controlled to greater or lesser extent, depending upon the economic justification for varying degrees of exactitude in processing different parts of various alloys. Present metallurgical equipment limits control of environment and its effects on metallurgical uniformity. To the degree that conditions are standardized, the precision of the casting is subject to control. Deviations from accepted norms of operation are instantly reflected in the size of the castings being produced, making them either larger or smaller than the norm.



Bad design features of this mold are: (1) limited amount of Cerrotru in aluminum holders, (2) wax injection sprue is too long and too small to compensate for solidification shrinkage, (3) sharp-angled parting line, and (4) fixed cores lock patterns



Good design features of this mold are: (1) the entire mold is made of soft-alloy, except for the steel cores and injection plate, (2) straight line parting with 90° angles to each, (3) draw cores assure production of undistorted waxes

resist wear. However, experience has shown that Cerrotru has better over-all properties, especially when molds are to be made for complex wax patterns. The extended mushy range of Cerrocast has a tendency to inhibit very fine detail in involved patterns, and offsets the potential advantage of a lower shrinkage factor. The Cerrocast material has been used successfully by some shops for parts of simple form that must be held to very close tolerance. On the other hand, other plants having wide experience with Cerrotru find that this alloy will handle satisfactorily all work, both simple and complex, and they depart from this analysis only in very special instances.

Cores in Multiple-Cavity Molds

Multiple-cavity molds are frequently made from steel to produce ganged patterns of small parts at minimum cost. Such molds are restricted to part design wherein the details are obtainable by simple machining operations. When cores are incorporated in such molds, they should be simple, straight-line-draw cores perpendicular to the parting line. Otherwise, the cores should be oriented with respect to the parting line so that the draw mechanism may be incorporated without complex machining operations. When the part design is complicated, it is invariably less costly, and more satisfactory from the viewpoint of casting accuracy, to make one or more master patterns and produce a multiple-cavity soft metal mold than attempt to machine the same shape into steel.

In gang molds, circular-withdrawal cores can be applied to produce cam surfaces or curvilinear internal passages. Such passages require a slight taper. The cores can be applied horizontally or vertically to the parting line. In single-cavity molds, cores of the types described can be located in any plane with respect to the parting line.

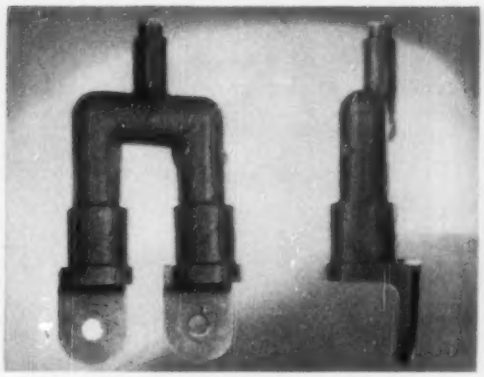
Use Strong Gates

Multiple-cavity molds may involve from 2 to 10 or more cavities. When properly designed, the common runner and series of gates will serve not only to admit wax to the die cavities, but also to afford safe means for handling the small patterns with minimum distortion. The runner and gates should be adequately designed for the metal to be cast.

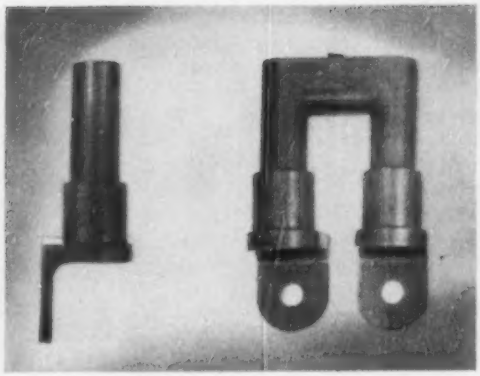
Other materials used for soft-metal molds are semi-hard alloys of zinc, such as Kirksite, and some lead-tin-zinc alloys such as type metal. The "Cerro" alloys other than Cerrotru and Cerrocast are used mainly for special problems. For example, if a master pattern has been incorrectly repaired or joined with a soft solder, the lowest-melting alloys must be used to minimize the chance of bonding with the solder on the master.

Kirksite has properties that require different treatment in all stages of application. The alloy cannot be used freely to make dies because of considerable volumetric change during solidification. This property necessitates comparatively extreme hydraulic pressure on the molten metal after it is poured and while freezing, in order to minimize cavitation, porosity and the mechanical effects of phase segregations. This high pres-

a Two-Cavity Soft-Metal Mold •



Bad patterns show circular indentations caused by insert cores in the poor mold. An undercut in the gate section of one cavity tended to lock the patterns. A wax flash is visible around the hole. This defect is unusual until after long runs



Good waxes are brought about by a straight, exactly centered parting line at suitable part locations. Maximum fill of the boss is secured by reason of the heavy, carefully machined gate. Use of draw cores avoided distortion of patterns

sure, combined with the stresses set up within the metal as a result of linear contraction of the alloy, prohibits use of Kirksite in forming molds from small, thin, delicate master patterns, or even from large, strong patterns wherein parallel projections are encountered.

Match Master With Mold Alloy

Where Kirksite has been cast against weak master patterns, the pressures employed and the stresses generated within the freezing metal have been sufficient either to distort or destroy the patterns. Often, strong patterns are so securely locked in the Kirksite that extraction is possible only by melting away the alloy. These conditions limit such hard zinc alloys to use with strong, simple, bulky master patterns. In construction of masters, additional solidification shrinkage of this die metal, amounting to 0.015 in. per in., must be applied to the pattern tolerances if precise castings are to be obtained. Thus, as a rule, a master prepared for forming a Kirksite mold will be oversized for making a Cerrotru mold. Obviously, the type of mold alloy must be ascertained before the master pattern is calculated and produced.

Where suitable for use, Kirksite occupies an intermediate position between the true "soft" metals and the unhardened carbon steels. Under normal conditions of use, a good Kirksite mold will last about as long as an unhardened steel mold, and costs less.

For most types of wax patterns, a straight carbon-steel mold, unhardened, is considered to have unlimited life. Locations or guide pins, draw-core pins and guides are usually case carburized to about Rc 60 to prolong accuracy of die alignment, which is very important.

Where the pattern requires very fine detail, small draw cores and multiple parting lines, particularly when the over-all part size is limited, the actual mold life may be as low as 100,000 patterns. This is primarily due to wear at the parting lines and around the guide holes for the draw cores, giving rise to flashing of the wax. When flash affects size of the pattern, life of the mold ceases because it is practically impossible to repair small wax patterns, and it is not economically sound to attempt repair of metal castings.

In producing large wax patterns, several factors establish nearly unlimited die life. Low pressures and temperatures are employed in filling large mold cavities with wax. When limited flash is formed on a large pattern, it can be removed readily with a hot knife, or the casting can be ground to remove flash. Such repairs are prohibitively costly on small parts or patterns.

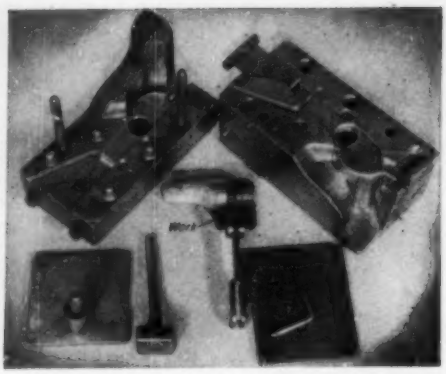
Molds Can Be Repaired

Prolongation of die life may be obtained in many instances by reworking the guide ways for draw cores and remaking the cores to correspond with the oversize dimensions in the guide areas. If these repairs are carefully done, no changes in size will result and no lines will bear witness to repairs. Molds are sometimes chrome plated.

Whether the mold is soft metal, Kirksite or steel, its life is determined by the endurance of the parting line. In the case of soft-metal molds, improper location of the parting line may limit

• Parting-Line Location Affects Mold Quality

Poorly designed mold for hand-release latch has an irregular parting line passing through functional surfaces, forming sharp-angled projections. To cut costs, precision draw cores were omitted, in attempt to make fork section self coring



Correctly designed mold provides right angles at all parting lines. Contoured sections follow non-critical dimensions in all planes. The fork slot is formed by a draw core, which is withdrawn before the mold is separated

the effective mold life to less than 100 patterns. This is particularly true when the parting line has been formed in a manner such that it includes thin projecting edges and/or compound curvatures. In all molds, sharp corners, small projections of die surface at the parting line and complex parting line contours must be avoided.

Parting-Line Requirements

As a rule, the die must be designed so that all parting lines will be substantially formed by metal sections ending in corners not materially less than 90° angularity. This frequently requires departure from single parting of the mold. As many as four or more partings are often required. Unless it is possible to remove quantities of undistorted wax patterns from the mold cavity, the tool represents a waste of money.

The parting line determines where gates, vents, risers and cores must be located. These materially affect the ultimate precision attainable in the casting. Where-ever the part must be gated, vented or risered, and where-ever parting lines must pass through functionally significant details of the casting, the degree of precision attainable in the casting is limited. Inclusion of finish details such as raised or sunken numbers, serrations, fine teeth or other precise projections or indentations are restricted or prohibited in any particular casting design by the proper or improper selection of the parting line.

Whenever minimum distortion is required for maximum pattern accuracy, under cut surfaces must be located in the mold to permit their formation either by draw cores, removable prior to parting of the mold body, or by the various mold sub-sections. The latter should free undercut sections with minimum friction or pressure by various die components. In other words, the body of the die cavity must either completely surround and support the semi-soft wax or plastic patterns while draw cores are being removed, or the undercut sections must present themselves to several sub-sections of the mold in such a manner as to permit the mold to be divested from the pattern without stressing the wax or plastic material.

Construction of the master pattern is the prime consideration in producing an accurate soft-metal mold. Calculation of the cumulative effect of all expansion and contraction factors to be anticipated in production of the desired castings must be carefully done.

Master-Pattern Tolerances

The degree of accuracy in producing either the master pattern or mold is illustrated thus: If the tolerance on the cast part is ± 0.005 in., the master or pattern die must be held to ± 0.0005 in. Where extreme precision is required in the casting, in the range of ± 0.002 in., the master or mold must be within ± 0.00025 in. It is obvious that unnecessarily close tolerance on castings should be avoided.

Great care must be taken in finishing the surfaces of the tools. All mold cavities must be polished free of scratches. Final polishing should be done by hand so that residual finish lines will

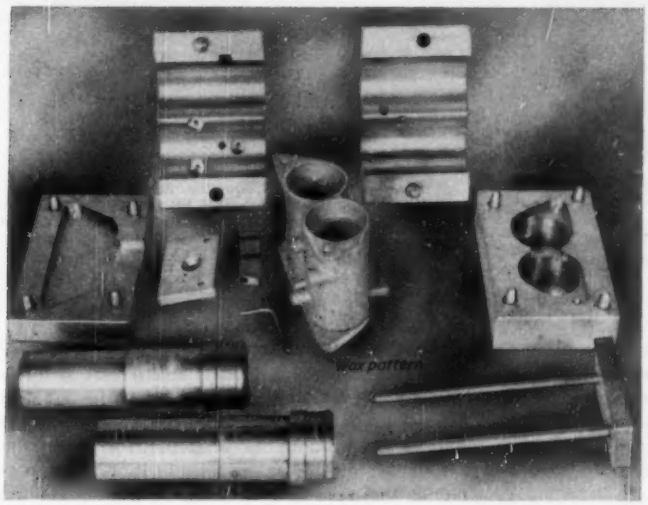
be parallel to the direction of extraction of the wax pattern from the finished mold. No draft is required on a master pattern intended for forming Cerrotru but straight walls must be held absolutely true. Reverse draft cannot be tolerated to avoid locking master in the die metal. In the case of masters intended for Kirksite molds, one degree of draft is desirable. On parts not involving very deep draws, no draft may be needed if the pattern is sufficiently bulky.

Where no draft is provided and the parting lines do not open all cavities in the mold, solidification shrinkage of the plastic or wax pattern is relied upon to free it for ejection. Usually it is desirable to include knockout pins in mechanically operated plastic forming dies. These are not generally required in wax pattern molds, which are, on the whole, manually operated. Compressed air is used to blow the waxes loose from the mold without distortion.

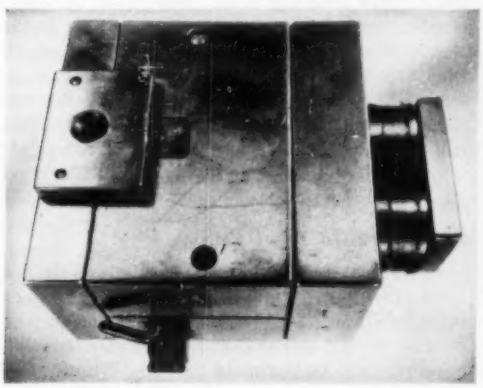
Whenever possible, machine the master pattern from the solid. If a built-up master must be used, assemble the components with great care. Pinning or riveting the various parts is sometimes satisfactory. Usually the parts are combined by brazing or silver soldering. Use of lead-tin solders is prohibited, because these low-melting metals will fuse with molten Cerro alloys or Kirksite metals, destroying the master patern. Repairs must be made with a braze or silver solder.

Always consider cores and core drawbar during design of the mold. It is seldom satisfactory to produce a solid master and from it make the various body sections of the mold, then attempt to introduce the cores in proper location. Often the volume of metal in the cores and draw lengths exceeds the volume involved in the pattern of the part itself. Therefore, calculation of the core dimensions must be made as carefully as those of the pattern, to produce accurate wax patterns.

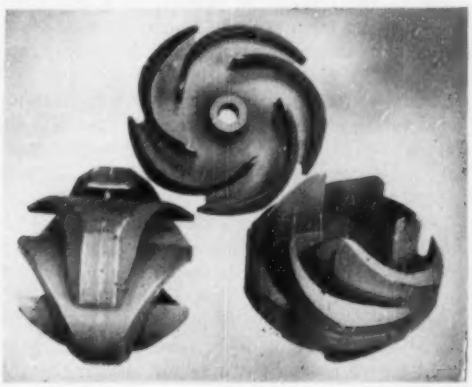
• Mold Material Depends on Product Shape



A steel mold will cost less than a master pattern, in many cases, if the various surfaces can be produced by turning, boring and drilling operations. For the work shape indicated, a steel mold is mandatory, regardless of the number of wax patterns required

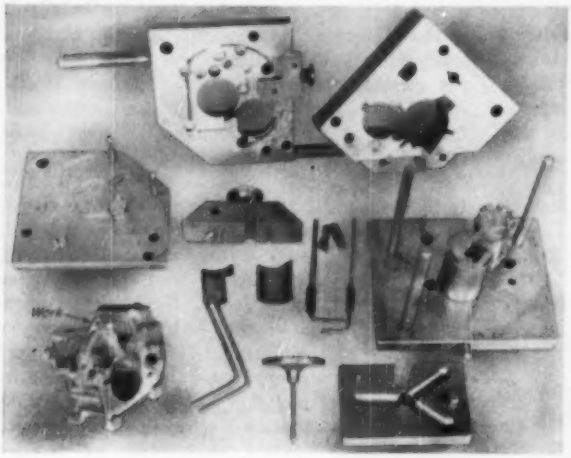


All parts of the mold, shown ready for injection of wax, are made of low-carbon steel. Guide pins and core pins are casehardened steel

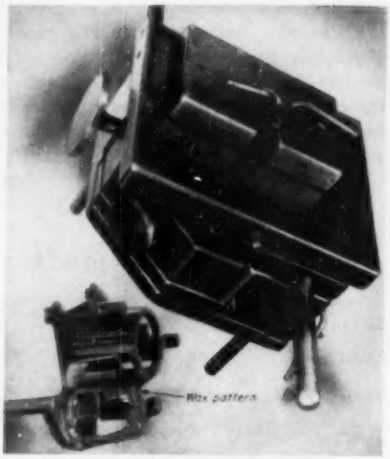


Opposite situation is typified by impeller wheel. Here, a master pattern is required, because the curvatures could not be economically machined in a mold

• Make Mold Flexible for Part Redesign



Complex castings often require detail changes and hence the 15 components of this mold were designed to permit easy reworking. The various parts are removed in a sequence that frees the wax pattern without distortion



No alternate production method can be used for making a casting like the wax pattern shown with the assembled mold. Several planes in part require numerous parting lines in the mold. Three runners feed wax to bosses

Mold details must be considered in compliance with the casting properties of the product alloy. In the past, inclusion of small cored holes in steel or high-temperature-alloy castings has been severely limited. Small ceramic cores tended to fracture when the molds were fired to 1800 F or more, or to fuse into the metal.

Insert Cores of Ceramics

To overcome this situation, a new technique involves use of precision, preformed, hollow, ceramic insert cores. At present these are available only to form straight holes of round, oval, square, rectangular, triangular or other cross-section. The hollow cores provide a channel for entrance of molten caustic to remove the ceramic from the hole formed in the metal. This lifts the restriction in coring holes in high-temperature alloys and modifies the relationships of hole length to diameter.

As it now stands, the added cost of tooling for hollow ceramic inserts, manual insertion of them, etc., limits the process to use in metals difficult to drill or contour machine. Their use is seldom justified in production of less than 10,000 parts. As an experimental development process, however, where cost is not a factor, design theories may be readily tried through use of the inserts on very few samples.

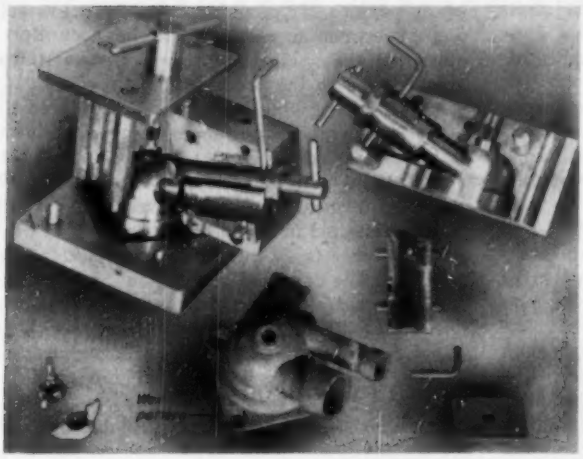
Mechanical properties of polystyrene plastics make them useful in simple designs involving extended production runs. Pattern cost is minimized when multiple-cavity, plastic injection dies can be used. Present limitations of plastics are due to the pronounced tendency for these materials to cavitate upon solidification. This precludes their use for precision patterns involving wide section differences. Use of plastic patterns is seldom economically sound when production involves less than 25,000 parts.

Dies for plastic injection differ considerably from those used for wax. They must be much heavier and must conform in basic outline to the requirements of the injection machine on which they are to be used. Massiveness is required to withstand locking pressures exerted by the machine as well as injection pressures. Often the basic support block is provided with holes into which the details of the casting cavity are introduced as inserts.

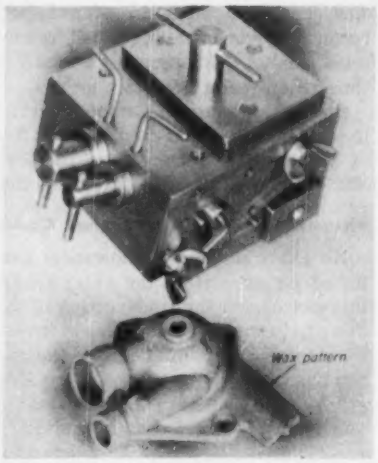
Plastic-Mold Limitations

At present plastic-forming molds are limited to designs that permit single, straight-line partings. In these parts, all holes must be perpendicular to the parting and preferably be self-coring details of the mold cavities. Where other features must be included which require draw cores, particularly in angular locations separate from the plane of parting, the costs mount

• Plan the Method of Dismantling the Mold



To avoid distortion of the complex wax pattern, 19 pieces of the mold must be removed from the mold in a sequence that "peels" them away from the wax. When the mold is assembled, the hand screw locks the components for injection. Major cores are shown in place in mold



Selection of planes and locations for parting lines represents an involved problem. Despite mold complexity, all parting lines are formed by near right-angled surfaces. The wax will be used for an aircraft-quality casting

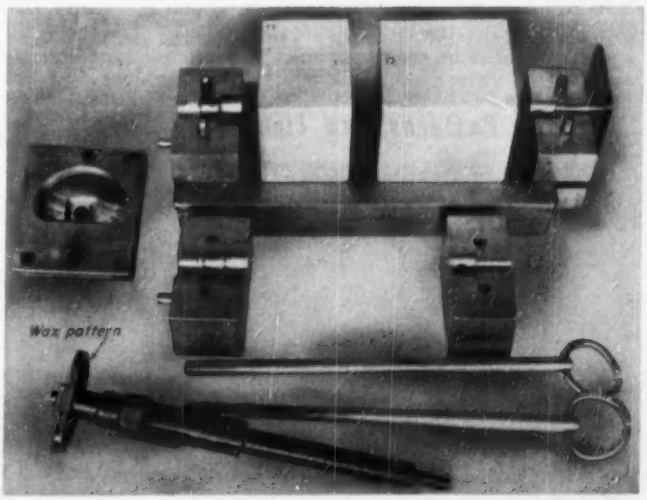
rapidly. Inclusion of manual or automatic cores either restricts productivity or increases tooling expense. In some instances, loose insert cores are used. These must be made in multiples to permit continuous operation of the mold, while patterns are cooling and inserts are being removed for reuse.

Occasionally, mold parts are made of aluminum to reduce weight, and hence operator fatigue. In such instances it is usual practice to incorporate a hardened steel insert for the precision details of the pattern and for any faces of the mold subject to abrasive wear.

Functional simplicity of the mold must be considered. In building a waxpattern mold, it is necessary to provide a series of dismantling operations that will prevent stressing the warm and pliable patterns during extraction. Guides must insure alignment of all parting sections well beyond the pattern line. This often requires inclusion of parting devices operated by springs, gears, or cams. Thus, molds should be engineered to "peel away" components from fragile patterns, and include provisions for guiding their separation until all details of pattern have been cleared.

Complex patterns often require that molds be

• Mold Design for Long, Thin Waxes



Diameters of rounds on the wax pattern must be concentric within 0.005 in. To avoid parting lines on rounds, mold sections are positioned on bedplate and locked in alignment with pins. Mold sections are stripped off wax in planned sequence. Guide base and center blocks are aluminum for lightness

divided into more than twenty components in order to form complex contours accurately. Such dies cannot be made from anything but steel, because molds involving small removable divisions cannot be operated for any length of time when made from soft metals.

Obviously, tolerances anticipated in sand castings are so broad that all deviations from changes of composition within the specification range and casting temperature are adequately covered.

Shrinkage for Investment Casting

No exact shrinkage allowances can be established for estimating the exact shrinkage to be incorporated in the construction of dies for handling patterns. The tolerances of investment castings are so close that the variations of metal composition, casting temperature, degree of degassing, etc., all have an important measurable effect on the actual casting size. Each deviation permissible in commercial tolerances for other foundry practices becomes a single control condition for production of precise investment castings.

For a heavy-sectioned casting made from a copper-base alloy, the shrink might be calculated at 2.5%. In casting a long, thin part of the same alloy, the shrink allowance might be 3.5%, because of the higher mold and metal temperatures required to fill the thin part. Failure to anticipate this differential correctly could result in incorrect casting dimensions in the order of 0.010 in. per in. from this factor alone.

Calculation of section tolerances is difficult for castings that include both heavy and light sections. The necessity of using hot metal to fill thin sections increases the total solidification shrinkage encountered in heavy sections. This often gives rise to internal porosity, unless adequate provision can be made for gating or risering the heavy sections. By producing a trial master and die, experimental castings can be accurately measured and studied before exact calculations are included in the production pattern.

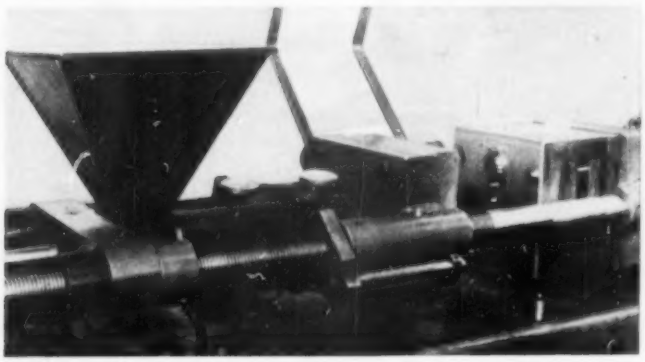
All of the variable conditions encountered in other casting process pertain in exaggerated form to the investment process. It is probable that the study of the factors governing both dimensional and metallurgical accuracy in investment casting will be reflected in better comprehension of production controls essential to all metalfounding practices. The degree of success that has been attained in controlling recognized variables permits the production of castings which can be held to within 0.002 in. per in. of exact dimensions.

Plants Usually Specialize

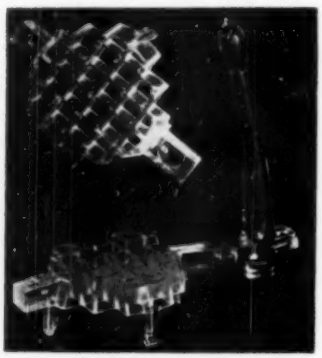
Solution of each new design problem must be predicated upon prior experience in handling similar problems. Apparent minor deviations in foundry technique from plant to plant can account for total inability of one plant to produce one type of alloy, and a similar inability of another foundry to handle another alloy or type of casting. Obviously the broader the background of any particular foundry, the better equipped is to deal quickly with each new question that is likely to arise.

Satisfaction can be secured only through close cooperation of the design and purchasing engineers of the buyer with the tool, metallurgical and production personnel of the supplying foundry. This cooperation should ideally commence with the first stage of design of a new part intended for the investment process.

Plastic Patterns Are Limited to Simple Shapes



Injection molding of polystyrene plastic is a fast method of making patterns for investment casting. Patterns must, however, have no major section changes. The die block could have four cavities



Cavitation of plastic is a problem, and is overcome by the proper design of injection sprue

STRESS-RELIEVED BRAZING RINGS CUT ASSEMBLY COSTS

Non-distorting silver solder preforms and induction heater reduce rejects, show enormous increases in production over manual brazing

BY JOHN EVANS
ELECTRONIC SECTION, ALLIS-CHALMERS MFG. CO.

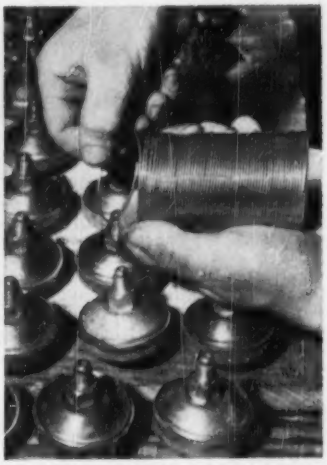
ELECTRONIC induction brazing, with solder preforms, is well established as one of the most economical methods of obtaining high-quality joints. With machine-wound silver solder preforms, however, difficulty is sometimes encountered because the rings distort under the brazing heat and fall away from the joint.

This condition existed at Wabash Manufacturing Co., where production of strainer assemblies for household refrigerators was being seriously impaired. Rejects were too high as a result of leaks, and brazing metal spilled over the side of the strainers.

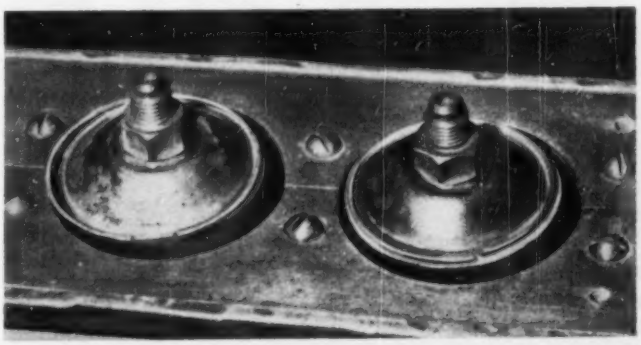
A solution was found in the use of stress-relieved, notched-coil brazing rings* made from Easy-Flo No. 45 silver solder which makes a consistently strong, leakproof joint, unaffected by the toxic refrigerant. Each ring is stress relieved, has a uniform diameter, and a wire size large enough to make a complete bond with a minimum amount of material. Rings are made in coil form and notched so individual rings can be easily detached from the coil. This makes each ring readily available, prevents entanglement, saves time and waste motion, and reduces loss due to distortion. Stress-relieved brazing rings do not deform at normalizing temperatures during the heating cycle, so the solder flows into the joint uniformly, rather than spilling wastefully over the side.

With an oxyacetylene torch and hand-fed wire, production was about 60 units per hour per operator. With stress-relieved preforms and a 20-kw induction heater, production has increased to 480 units per hr per operator. Maintenance, tube replacement and current consumption come to about 80¢ per hr, as compared to about $3 per hr with the previous method.

Regular, machine-wound brazing rings created both a handling and a production bottleneck. Breakage, distortion and wasted time and effort in handling proved too costly and impractical in silver-brazing strainers for domestic refrigerators



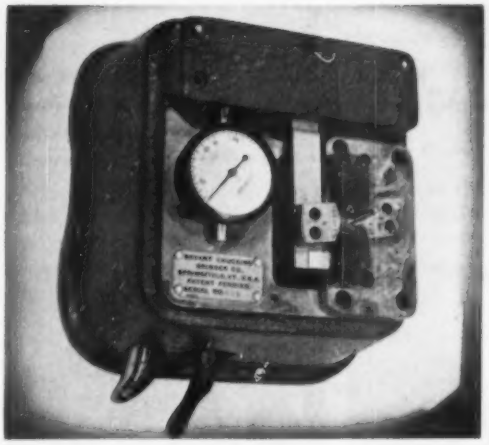
Stress-relieved silver brazing rings, made to job specifications, retain tolerance to 0.001 in. without distortion. Each ring can be removed easily from the roll, eliminating material waste, speeding the positioning of the rings on the work, and producing a better job



Strainer assemblies positioned in the work coil. Unit at left shows how machine-wound rings are badly positioned and tend to overlap the edge. Right-hand unit shows stress-relieved rings fitting snugly in place. Method increased output 800% and reduced costs 64%

* *Patented by Lucas-Milhaupt Engineering Co., Cudahy, Wis.*

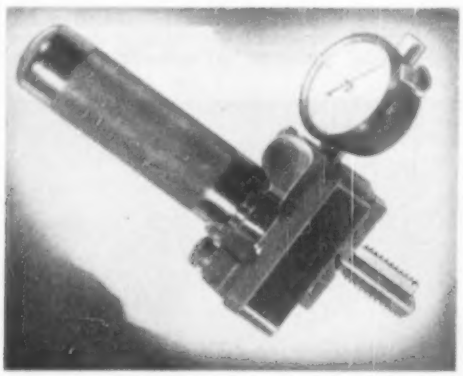
SAVE PARTS --- AND



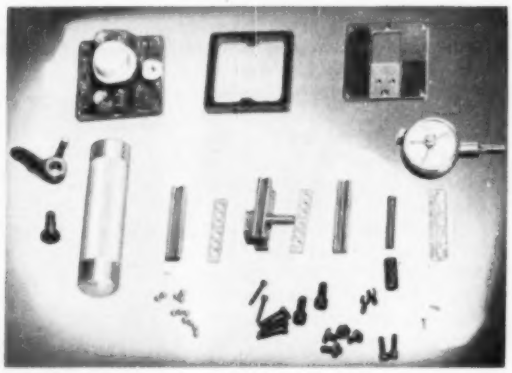
WAR DESIGN ... Sound in principle, but costly and difficult to manufacture, this war-designed quick-operating gage for internal threads was sold in limited numbers as a war tool. The split plug can be contracted to clear a threaded part, then expanded to contact the thread. Measurement is indicated on a dial indicator. Postwar market was potentially good—in one plant the gage saved $1000 in labor in one year, in another it cut a 12-day (2 shift) plug-gaging job to 3 days (2 shifts). But it cost too much—only four of each 100 inquirers became buyers

OLD GAGE DETAILS ... Six castings, most involving precision milling, with several fussy milling setups required for right-angularity, were the basis for the old bench gage. A number of surfaces had to be machined flat and parallel. The reed suspension required a lot of know-how in assembly and adjustment. The indicator did not face the operator, adjusting screws required the gage to be moved, the operating lever didn't look well; in fact, the entire appearance left something to be desired. Separate gages were required for internal and external gaging

BRYANT had a good gage, but it cost too much — only 4 of each 100 inquirers became buyers . . .

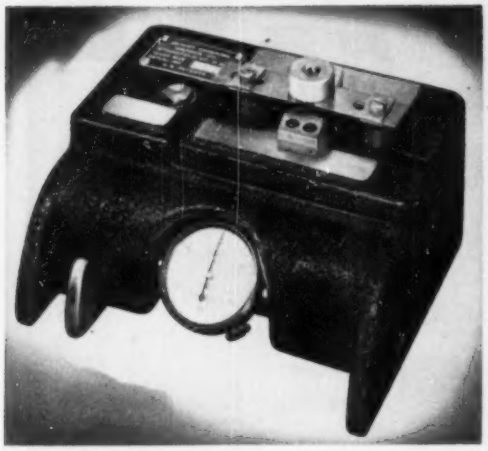


USEFUL, BUT HEAVY ... Original design of the portable or hand gage was heavy and bulky and required some precise machining. As on the bench gage, gage fingers were interchangeable, but the unit is suitable only for internal inspection. Cost was $250, about 30 times that of a hand plug gage, and too much to win acceptance in the field



OLD PARTS ... Basic principle of the portable gage was a slide moving on two sets of ball bearings. This meant precise machining of the anti-friction slide and some heavy steel parts. There were twelve parts to be machined and most of the screws were specials. Weight was 29 oz, readily understandable when the parts are laid out as they are here. The 3-element gage segments were used

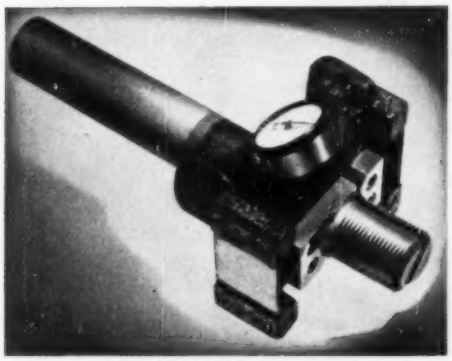
SAVE MONEY



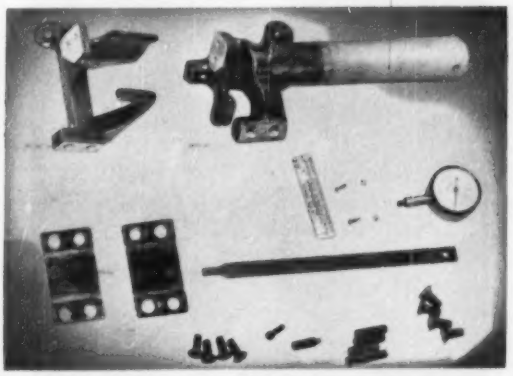
NEW DESIGN ... Better appearance at a cost cut of more than half resulted from basic redesign of the gage. Here a ring thread gage is in place on the gaging fingers. Original design involved a triple gaging element, one finger passing between two others to give 3-point contact. The part to be gaged rests on reeds, and a squareness-of-face gaging element is available as an accessory. Production methods for the gaging elements were revised and units standardized. Internal and external elements are interchangeable

NEW GAGE DETAILS ... Only two castings are required for the new gage, and two small pins. There is no fussy machining, no problems of flatness and thickness. The gage can be assembled in a fraction of the previous time and a common base checks both internal and external threads. The operating lever is more convenient, the indicator is spotted to face the operator and all adjustments can be made without moving the gage. Resulting reductions in production cost permit a decided cut in sales price

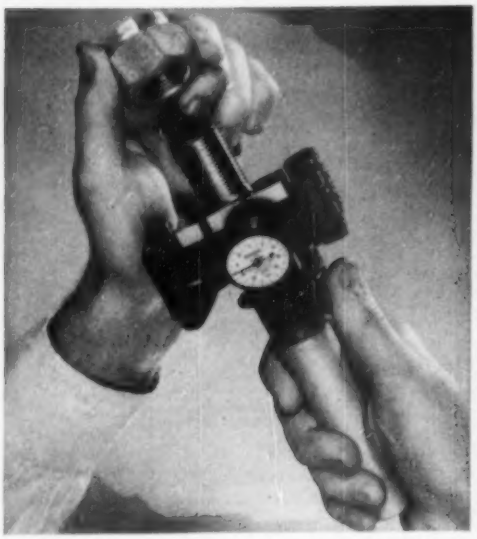
SO a war-made product was taken back to principles and rebuilt — to cut weight 50% and price 60%



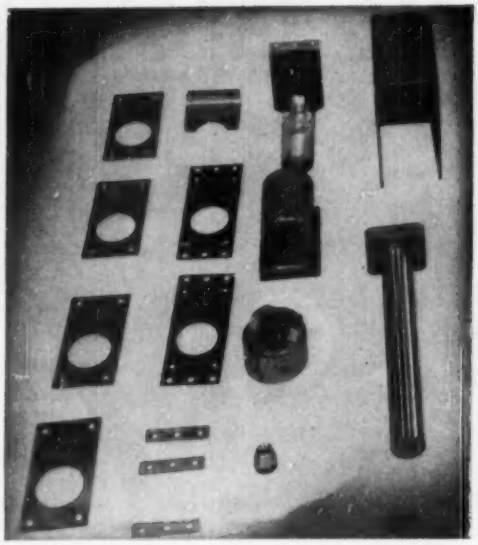
LIGHTER AND CHEAPER ... By utilizing the 2-point segment for gaging, the entire portable gage could be changed. Simple reed suspension replaces the anti-friction slide, a leaf spring in the handle replaces the coil. Two aluminum castings require only facing and drilling. There are only four machined parts and weight was cut to 14 oz—or about 50%



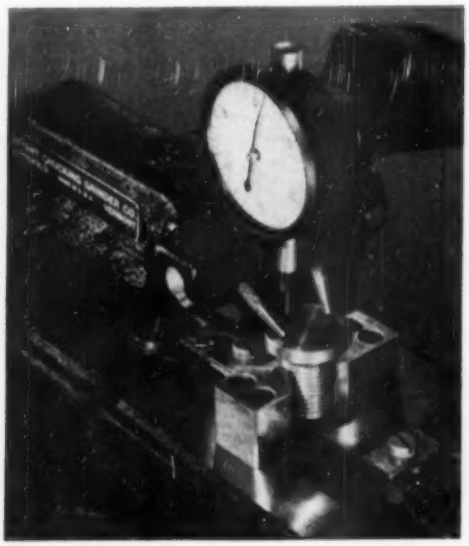
NEW PARTS ... Simple design cuts maintenance cost, as well as cutting machining and assembly time. While casting shapes are complex, this presents no problem after initial design. It was possible to cut sales price from $250 to $98—or 60%, making the gage sell for about twelve times the cost of a hand plug



PRINCIPLE ... The new gaging method is shown more clearly in this view of the portable gage in use. Each interchangeable segment is held by two cap-screws. Flats on about a third of the face provide quick guiding for the part to be gaged when the segments are collapsed. Gaging is as accurate but elements are much simpler than for the 3-segment system



COSTLY PARTS ... The original squareness-of-face attachment for the bench gage involved 16 parts, several being complex machining jobs, as can be seen here. A reed suspension created a number of limitations in this case. So the attachment was redesigned and simplified, as shown below



FACE GAGE ... With the part held in threaded jaws for external gaging, face runout can be shown on a second indicator by this 3-point contact gage. Rotating the part accurately indicates the amount of face runout with relation to the thread

CHEAP PARTS ... The new design involves only ten parts, but beyond that, only a few drilled and reamed holes are required, with no close fits. Counterbalances replace the reed suspension to give greater flexibility

ROUND TABLE

Series Business

"For the luvva Mike, what are you sticking that thing up on the wall for, Al?"

"What do you mean, Ed? It's only the box score sheet for today's game."

"Exactly, and you're going to have the guys running up to the notice board all afternoon, to see how their team made out."

"Oh nuts! I'm going to have one at each end of the shop, so most of the guys can see it without even leaving their machines. And, what's more, the Old Man has agreed to have the score announced over the PA system, inning by inning."

"Well, if that isn't the craziest thing I ever heard. How do you expect to get any work done around here?"

"Oh, take it easy, Ed. Everybody's interested in the game. And you know darn well that if we don't tell 'em, they'll keep sneaking over to a phone and pestering the operator, or else calling up friends outside. They're going to find out somehow."

"It's bad business, Al. A man's supposed to keep his mind on his job. Mark my words, your scrap rate is going sky-high this afternoon—and your accident rate, too, or I miss my guess. If they want to know the score, let 'em wait til 4 o'clock."

"Look, Ed. Maybe you don't like baseball, but I do, and so do most of the boys in the shop, and they want to know how the home team's making out. And if they can hear the results without leaving their machines they won't be hanging about in groups, or visiting back and forth to see if anybody has any dope."

"If you let them do that, Al, it just shows you haven't got proper control of your men. I'd like to see anybody in my department wasting time by visiting."

"Shucks. I'm no Simon Legree, and I'll bet you my men will turn out just as much top-quality work this afternoon as any other day. And what's more, I'll bet your production will be down because half your guys will be popping into my department to have a look at the score."

"Exactly! You're going to undermine discipline in the whole plant by pampering your department."

"That's not pampering, Ed. It's just good employee relations. Treat the fellows like human beings. Keep 'em happy and they'll do better work."

"Well, I don't agree. Baseball, or any other event has no place inside the plant. This is a place to work."

WHO'S RIGHT? *Does it hurt plant discipline to publish baseball scores or other major sports results during the day? Lots of plants do it, but others refuse. How do you feel about it? Discussions of earlier topics appear on later pages.*

SPECIAL FUND SUPPLEMENTS

Chapman Valve, facing unrealistic Treasury depreciation rates and declining value of the dollar, had an independent appraisal of its equipment made. An added reserve of $800,000 has been set up and 1950 replacements will total about $300,000

BY E. J. TANGERMAN, MANAGING EDITOR

HAS postwar decline in the value of the dollar made your depreciation reserve too small? Did you run your equipment three shifts a day during the war, so its rate of wear tripled while the Treasury depreciation allowance plodded on at the same old 16 years?

The Chapman Valve Mfg. Company, Indian Orchard, Mass., was in just that position. In the calendar year of 1948, the company installed a continuous molding and pouring setup and a new cupola in its iron foundry, converted the old steel foundry for welding and heat-treating, and bought a few machine tools. Total for these steps was $509,027.80.

During this same year, it became obvious that a great number of machine tools required replacement. But the balance sheet showed a depreciation reserve of less than a million dollars (on equipment that had cost about $3,200,000), insufficient to cover replacement at present-day prices.

CHAPMAN'S EQUIPMENT SITUATION:

	DEC. 31, 1948	DEC. 31, 1949
Cost of Machinery & Equipment	$3,214,075.25	$3,387,292.72
Reserve for Depreciation	901,915.22	1,115,087.60
Net Worth Machinery & Equipment	2,312,160.03	2,272,205.12
Reserve for Excess Cost	400,000.00	800,000.00

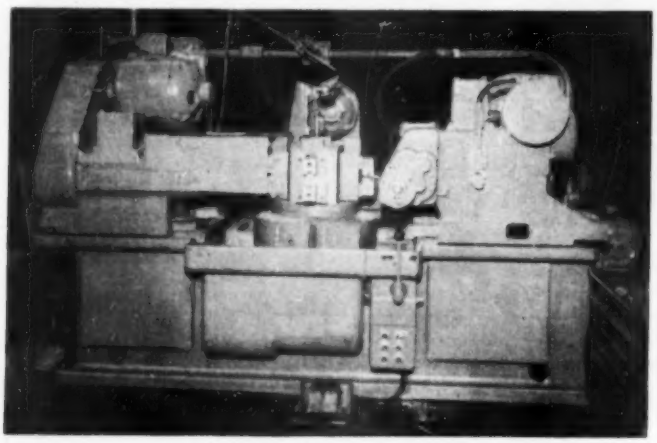
To obtain an independent appraisal, Chapman called in the Fire Insurance Association of Hartford, Conn., which maintains records showing replacement value for every type of machine tool built since 1900. The survey indicated that depreciation allowances were $800,000 too small.

To make up the difference, the company arbitrarily transferred, each quarter of 1948 and 1949, $100,000 to a special reserve for replacement, funding these amounts by purchase of U. S. Government bonds, as shown above.

Late last year, Works Manager George Fox presented a list of immediately advisable replacement projects. Most of these were approved and equipment is now on order or being delivered. Summarized in the table on facing page, approved projects total about $285,000. Total replacement expenditures this year are expected to be about $300,000, as compared with slightly more than that last year and the aforementioned $500,000 in 1948.

Many of the new units show savings of more than 50% of production time, three from 75 to 80%. One inexpensive machine will more than double output and mill the valve plug sufficiently accurately, both faces at once, so a grinding operation is eliminated and the plug becomes reversible. In most cases, the new machine will replace over-age units—sometimes as many as three or four machines. In one or two cases, the replaced machine, while not over-age, has been worn to the point of inaccuracy; and in at least one case, the old machine has insufficient capacity.

Chapman Valve is, of course, in the position of enjoying high postwar volume, so its surplus was sufficient to permit a shift of funds. But in any case, the recognition of the need for modernization and the practical approach to the problem can be helpful to other metalworking plants currently facing the same problem.



This multiple-head, tool-rotating chucker was also a 1948 replacement

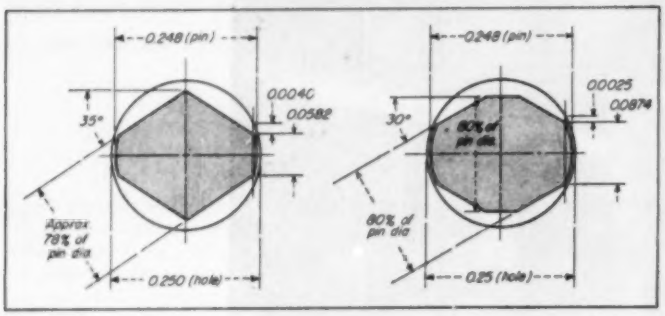
INADEQUATE REPLACEMENT RESERVE

This high-speed horizontal boring, milling and drilling machine, purchased in 1948, has 14-ft horizontal and 10-ft vertical travel. Behind it is a new 86-in. vertical boring mill

WHAT CHAPMAN IS BUYING THIS YEAR

MACHINE TOOL	APPLICATION	COST	SAVING	REPLACES
Duplex miller	Machine steel valve plugs to 12"	$25,000	75% of time	plug-rolling lathes
3-way miller	Flange 3 faces on steel body to 10"	42,000	60% of time	3 setups on auto lathes
3-way flange miller	Flanging 6-in. valve bodies	42,000	70% of time	two 1908 and one 1920 machines
Twin hand miller	Milling plugs (auto retraction)	6,080	doubles output, plus	rough-milling and grinding; makes plug reversible
Vertical shaper	Splining valve body guides	24,000	50% of time	— — — — — —
Borematic	Check-valve seats & rings	24,000	70% of time	under-capacitied internal grinder
Borematic	Seating valve bodies up to 2½"	19,000	69% of time	two 1922 and two 1925 machines
Turret lathe (23x60)	Various jobs	15,000	80% produc. increase	1912 engine lathe worth $578
Turret lathe	Various jobs	15,000	30% produc. increase	1927 unit
Turret lathe	Machining yoke nuts for large valves	18,000	Old unit inaccurate	20-yr-old inaccurate unit that has run 3 shifts steadily
4-spdle auto lathe	Bar machines	30,000	Present machines slow	two 4¼-in. single spindle units, secondhand in 1934 and 1938
Facing machine	Simultaneous plug & gate facing	14,000	78% of time	2 or 3 old units; makes plug reversible
12-spdle drill	Drill flanges	11,000	15-20% produc. increase	8-spindle unit

Practical Ideas



Diamond Locator Pins: New Design

THIS DISCUSSION was prompted by the article on locator pins by Edson C. Bates in Practical Ideas some time ago (*AM*—Jan 9 '50, p 127). Although diamond-shape pins have been used to allow for center-distance variations in jigs and fixtures for many years, their designs have not varied much from the conventional shape.

Our standard work-pin shape differs from the ordinary in that we have six facets—plus the two curved sections. The flat faces are angled at 30° to each other, which produces a cross-sectional area about 66% larger than that on the design shown by Mr. Bates. The design also produces a dimension across faces that is 80% of the pin diameter, which is a useful standard dimension in calculating pin sizes.

We like our plan for several reasons:

1. Strength is improved.
2. The 30° angle is easy to remember and easy to machine.
3. The 80% factor is handy when we use decimal dimensions (and we do).
4. There are no sharp edges, even if no filing is done.

Of course our design will not allow as much center-distance variation as the other, and in rough work this would be a disadvantage. But in our close-tolerance work, this factor is not important. For example, as illustrated, a pin of the other design with a nominal diameter of 0.250 in. would handle a deviation between pins as large as 0.0040 in. Our design on a 0.250-in. pin will only take a deviation of 0.0025 in., but on parts as small as watch plates this is a large variation.

Often we utilize non-ferrous materials in our work and fixtures, so the added 66% area gives us extra strength which is essential when the fixtures are subjected to many operations. This feature may make the design useful to many other shops which do larger work than we do. *E. W. Drescher, Hamilton Watch Co., Lancaster, Pa.*

TINY BURRS, made by centerpunching a flat surface in a number of spots, make perfect spacers when two parts have to be silver-soldered together. For best results, the punch marks should extend up about 0.001 to 0.002 in. from the surface. Increasing clearance between the surfaces makes the joint weaker; and reducing clearance makes solder flow between the surfaces more difficult. The idea works well on furnace jobs. *Robert Roedder, Berwyn, Pa.*

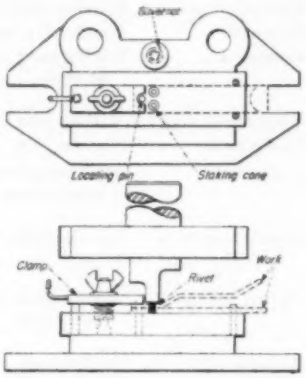
Riveter Clamp Holds Parts for Assembly

TO ELIMINATE the danger of an operator getting his hand caught under a riveting head while he holds parts that are being riveted together, a quick-acting clamp was added to a fixture. Two parts for a hydraulic-vibrator assembly were to be assembled, but one part was unbalanced; so it had to be held somehow.

Both parts were located by pins in the fixture, over which holes in the parts were located. At the left end of the fixture a spring-loaded clamp was fastened to grip down over both parts. This was cut away to clear the locating pin in the lower die.

Sequence during production was to locate the parts by hand, then swing the clamp in place and turn the thumbscrew part of a turn. When the riveting was done, the clamp was loosened slightly and was swung out of the way by means of a bent pin in its end. The operator's hand gets no closer to the punch than the thumbscrew.

Eliminating the danger to the operator was one result of this setup. Another was to eliminate a pressure pad, which normally would have been included with the tooling to hold the top part in place after the riveter head dropped. *Anthony Gabriele, Brooklyn, N. Y.*

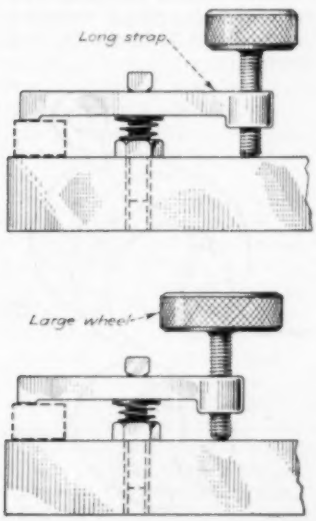


Larger Wheels Make Strap-Clamping Easier

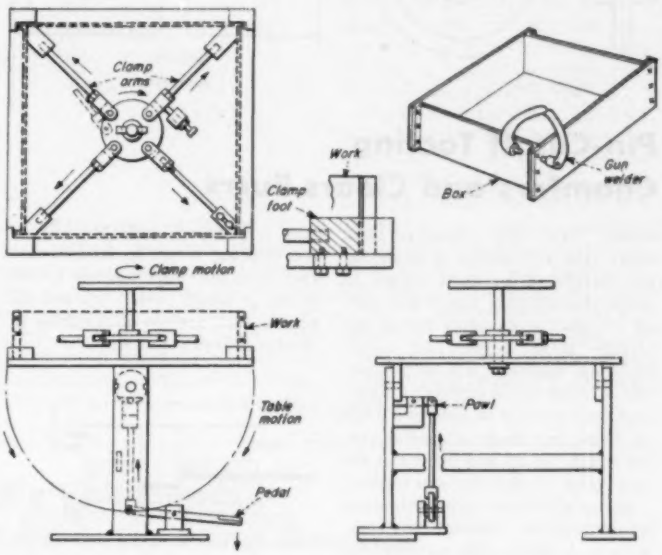
MOST TOOL ENGINEERS, for some unexplained reason, specify that clamp straps must be the same length from block to bolts as they are from bolt to pad. It really isn't necessary, and in some cases is not advisable.

When only a limited amount of space is available on a jig or fixture, it is perfectly O K to make the front section (that nearest the work) shorter than the rear section. In the illustrated case, this theory allows making the knurled hand knob larger than on the original design, which makes clamping easier. The over-all length is the same in both cases. The clamping force is also the same if the knob is turned down the same amount as before.

As long as the strap is strong enough, this length can be made as short as possible or practical on the particular fixture. The important thing in a clamp is the down-pressure exerted at the pad. The ft-lbs of leverage on each side of the bolt have to be the same in any case, so the amount of down force at the block is less in the illustrated new design than the down force at the bolt. *A. C. Eagle, Dayton, O.*



RESEAL CANS of alcohol, special machine oils, and small-quantity lubricating oils with modeling clay in both holes in the can tops when two holes are punched. The material will seal easily and hold even if the can is upset. *William M. Robison, Mt. Holly, N. J.*



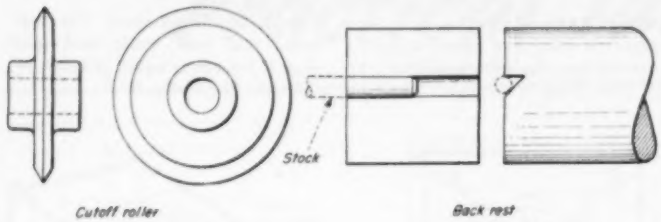
Equalizing Welding Fixture Clamps Box Parts

FOUR SIDES of a sheet-metal box frame were to be spotwelded together with a welding gun. To save time and make the operation convenient, we made a fixture with four clamping arms which locked the sides in place.

The fixture is built up to table height on a flat-metal base with two upright supports. The flat table is carried on two pivots, one through each upright. The pivots allow swinging the table down to a nearly vertical position so the box stock can be easily loaded into the fixture. To hold the table in either of two vertical positions and the horizontal position, three slots are cut into one of the brackets which support the table. One slot is engaged by a pawl supported by a small bracket on the upright and controlled by a pedal.

Clamping is done by the four arms, on the ends of which are shaped blocks that fit into the corners of the work. The arms are pinned to a round plate that is keyed to a vertical spindle bolted so it can revolve in the table. Rotary motion of the plate is stopped by an adjustable screw mounted on the table. All arms are adjustable as to length by nuts at the fittings that join them to the plate.

An operator loads the four sides for the box into the fixture, locating them inside the four milled corner blocks. He clamps the fixture by turning the handle on the spindle. Welding is done from an overhead-supported welding gun. One side of the box is welded after the fixture is swung down to a vertical position, held there by the pawl. The other side is welded with the table swung over 180°—thus placing all the spots which are to be welded in a horizontal plane. *Kenneth L. Stoltenberg, Milford, Mich.*



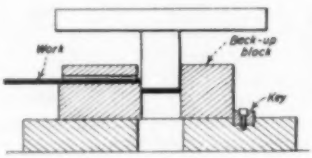
Pin-Cutoff Tooling Chamfers and Clears Burrs

SMALL STOP PINS, alignment pins, drive pins and anchor pins should be chamfered at their edges to make drive-fitting easy. But cutoff of small stock often forms relatively large burrs, and hand-finishing methods are expensive. For a batch of thousands of stainless-steel pins, ⅛ in. long and 0.025 in. thick, we made a special cutter which cut off and burred at the same time the chamfer was formed.

Setup was made on an automatic screw machine, although any lathe with a feed-through spindle and collet attachment could have been employed. Cutoff was done with a V-shaped roller that pressed the rotating stock against a fixed rest and pinched pins off. The rest was a block of HSS that was slotted to grip the stock so the top edge of the slot contacted the top of the stock. As the roller pinched the stock a slight burr was raised, but the sharp top edge of the slot in the rest immediately cut this off.

The top edge of the slot in the rest was at 90° to the face of the rest, and the bottom edge was at 45°. These were formed by grinding with a formed wheel and then grinding off the face of the block flat. The block was mounted on the rear toolpost, and the roller was set up on a spindle mounted on the front toolpost in a forked holder. It was made of carbon steel, hardened to 60 R_c.

In operation, the tooling is flooded with coolant, and the pin stock is rotated at the highest speed of the lathe spindle. Stock is fed through a small guide tube and the collet to hit a stock stop. The stop is dropped, and the roller is fed into the work. In-feed is controlled so the roller will not hit the block. A small basket catches the pins as they are cut off. *Charles W. Brown, Greenwood, Mass.*



Key Anchors Block For Backing-Up Punch

DIES FOR FORMING or cutoff often require a back-up block set against the punch to offset side pressure. Dowels are usually found to be a poor holding device for anything but light metal. One method of holding the back-up block is to set it in a milled pocket in the die shoe, but this weakens the die shoe appreciably. The best way we have found of holding the back-up block is to use a key.

The key itself is set in a milled pocket in the shoe, but because the key is small, the milled slot does not do too much weakening. The key takes more pressure than dowels will, and because the slot is nearer the outter edge of the shoe than the back-up block, the slot has little effect on the strength of the shoe.

The key, about ½ in. thick, is made a tight fit, and is held down by a screw into a tapped hole. *F. C. Twist, Whitby, Ontario.*

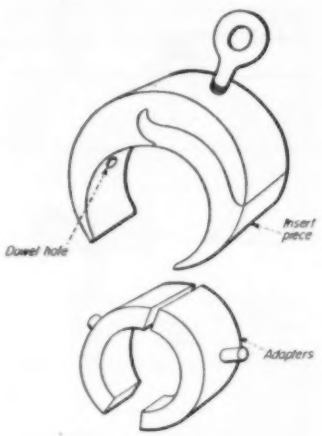
Positive Bar Clamp Lifts Stock from Racks

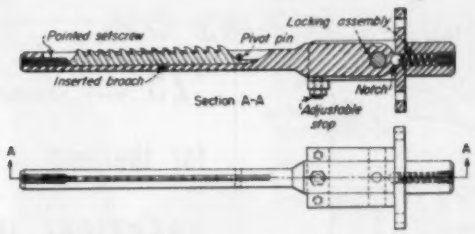
SLINGS for lifting round stock from stacks are not only dangerous, but are also less handy to use than this clamp. The device can be swung from a small hoist, or can be made in a large size and dropped from a crane for large stock.

The rig is cut out on a bandsaw from a round disk of steel. One to handle 3⅞-in. bars was cut from a 6-in. disk, 2½ in. thick. The inner curve which actually contacts the bar stock was made by boring a 3⅞-in. hole 1⅜ in. off center.

The shape of the bandsaw cut makes the insert piece hold in the larger outside piece as long as there is stress on the gripper. With the load slacked off, the insert can be slipped or wiggled out of the larger piece to release the stock. A tapped hole was drilled vertically down through the larger sector to hold an eyebolt, which could be screwed down to clamp in the insert. However, this clamping action is not essential if the curve is followed closely when the disk is bandsawed. Two small dowel holes were drilled into the clamp to allow inserts to be held to adapt the clamp for smaller bar stock.

Bars are gripped by the clamp at their centers of gravity, which simplifies rigging and makes only one hook from a hoist or crane necessary. *David T. Lyons, Sr., Belmont, Mass.*



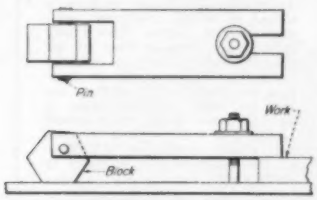


Broach Works From Lathe Turret

WHEELS with a 12-in. OD and a 9/16-in. bore had to be turned, faced, drilled, then broached to form a keyway. By making a broach holder that fitted the turret, we were able to do all the operations in one setup.

A shank turned to fit in a turret hole was fitted with a flange and drilled through from the rear end, then tapped. This hole carried a small bearing ball, a coiled spring, and a setscrew. After the broach bar was made and formed to a notch in the vertical plane and one in the horizontal plane, it was assembled in the yoke of the shank, where it pivoted on a large pin. The spring-loaded ball fitted the notches, holding the broach holder either horizontal (for working) or vertical (to keep it out of the way during drilling). To hold the broach holder horizontal while it cut the wheels, an adjustable bottom stop was made by drilling and tapping an extension on the yoke of the shank to carry a setscrew.

The holder itself was made by milling a slot in a piece of bar stock. The rear end of the slot was fitted with a permanent pin, while the front end was drilled and tapped for a pointed setscrew, which held the broach blade in place. The broach was made from HSS. Both ends were ground off at a slant so they would fit under the locating pin and the pointed setscrew and would be clamped securely in place. *Wilbert E. Johnson, Forest Lake, Minn.*



Angular Clamping Block Has Adjustable Height

TOO MUCH TIME is lost in many shops when mechanics have to hunt around for suitable clamping blocks for a table setup. The illustrated block design will take care of just about all cases within its range, and it can be made big or small for various applications.

The strap is cold-rolled steel, notched out at both ends. The slot for the anchor bolt and washer should be fairly long. A pin is driven through a hole off center in the block and through the yoke at the other end of the strap.

To make the block adjustable, its sides should be milled off at odd angles to each other—no angle the same. The pin hole is not on center, but it should not be so far off that it is not directly over a portion of each side. *George Burnley, Oakland, Calif.*

Big Roll Needs Two Supporting Steadies

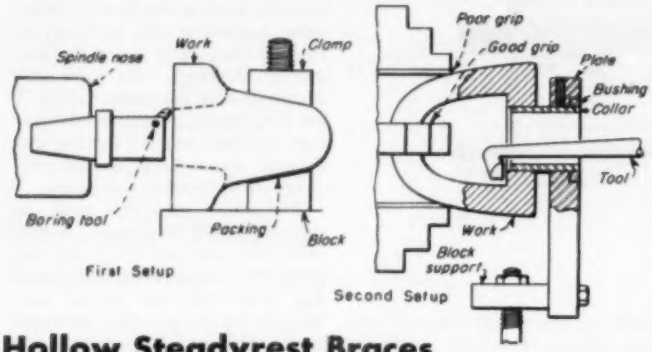
THE ILLUSTRATED WORKPIECE on one of our large engine lathes is a spike roll, used to pull woven carpets out of a loom. Once in a while we have to repair the bearing surfaces on these 18-ft rolls, which means turning the 4-in. sections (spaced along the roll) down to a smaller diameter. Unfortunately there isn't a circle of unbroken surface anywhere along the roll.

We manage to turn the areas by steadying the roll in two rests. The front end of the roll, of course, is chucked. The roll is much longer than the lathe, so we have to support the outer end on a steadyrest that is supported by steel framework built up from the floor. The tank-like machine behind the right-hand half of the roll is just a lapping machine which has to be opened up to allow mounting the roll. The lapping machine has nothing to do with the setup, otherwise.

The center steadyrest, in order to clear all of the four bearing areas, is fixed so it supports the

work on a section where the roll is alternate strips of flat surface and spiked surface around the circumference. We made a steel sleeve which would clear the spikes, and mounted it around the center of the roll. It is held to the roll by setscrews. The steadyrest actually centers the collar, which, in turn, supports the roll.

The saddle is to the left of the middle steady, so only the left two bearing areas can be turned in one setup. To get the other two, the roll must be reversed and recentered. *Raymond Cady, Nye-Wait Co., Auburn, N. Y.*



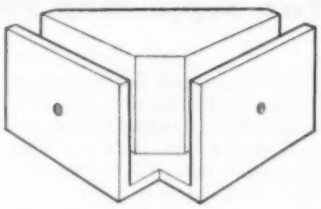
Hollow Steadyrest Braces Shackle Links for Boring

WHEN WE HAD to face, bore, back-counterbore, and back-face some hefty shackle links on a relatively small lathe, here is how we did it:

First we made a setup with the links held in a clamping fixture on the cross-slide of the lathe. They were held rigid—located on center. We managed to do the facing and boring with the links in this position by installing a taper-shank adapter in the spindle nose of the lathe. The adapter held first a boring tool, then a facing tool.

To get the inside surfaces of the links machined, we had to chuck the work somehow. Although two chuck jaws could hold the work with a good grip, the other two would not grip securely because of the shape of the work. What we did was this:

A heavy mild-steel block, fitted with a tenon, was mounted on the ways of the lathe and adjusted to center. On top of this we mounted a vertical plate. With the boring tool still in place in the spindle nose, we bored out the plate to take a bushing and a moderately long collar that had the same OD as the ID of the workpieces. The saddle had been shifted behind this block when we started work, so it was rigged with a long boring tool which would cut the inside face and inside diameter of the work through the hole in the collar. Each link was chucked on center and gripped by the chuck jaws as well as it could be done, and the collar on the block was moved up to fit inside the already bored work. The chuck actually drove the work so the boring bar could machine inside the work, but the collar supported and steadied it, and insured that it ran on center. *Dan Penway, Carlisle, England.*



Welding Fixture Locates Stock for Forming Corner

HAVING A NUMBER of metal boxes to weld up, I made a set of these fixtures to speed corner-welding.

The fixture is made from a large, triangular piece of stock. The steel is first milled to form slots at right angles, then the corner is milled out. To prevent the flat pieces of the box from being welded to the fixture, a wedge was milled out of the inside corner of the fixture.

Setscrews in holes in the two sides of the fixture clamp the flats in place. Because the fixture slots were milled accurately, the box sides have to be welded at right angles. Rigid clamping prevents distortion. *Oscar F. Lambert, Columbus, Ohio.*

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for the best

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Rocco Boccia's
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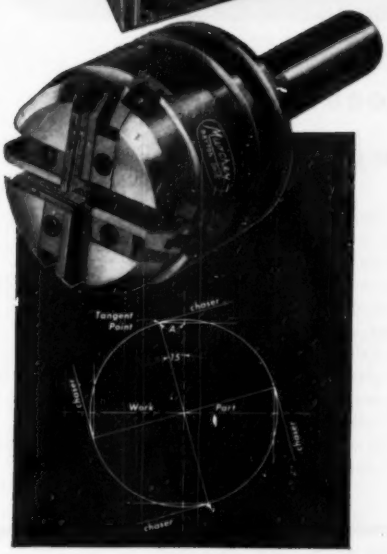
Simply "clean up" your chasers as required, and RESET to cutting position instead of REGRINDING



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This Fixture will handle both right and left hand holding blocks for all Murchey Tangent Chaser Die Heads.

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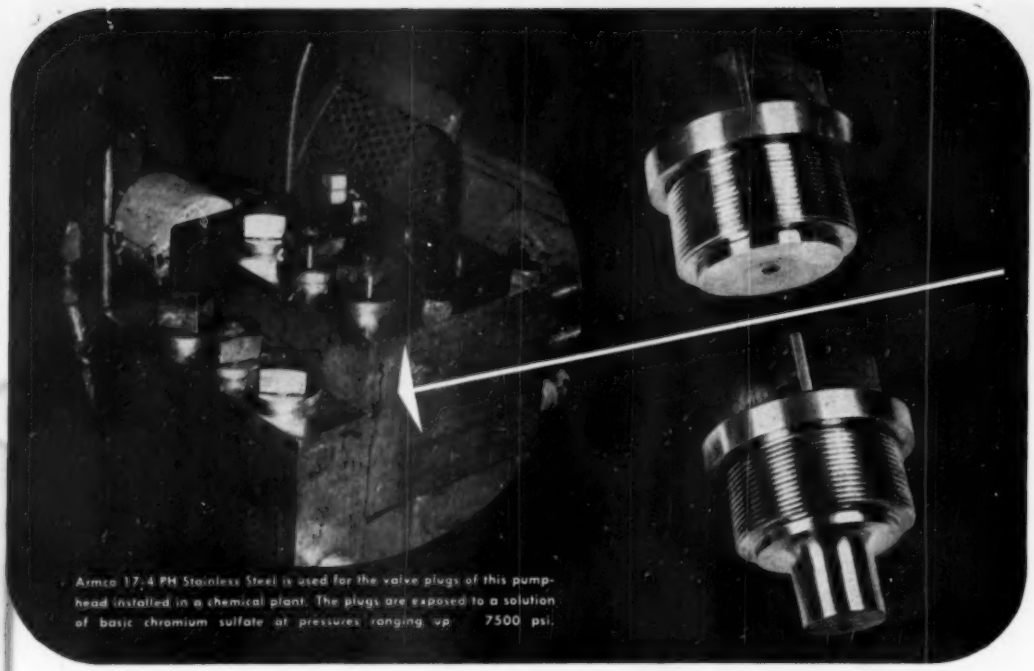

Armco 17-4 PH Stainless Steel is used for the valve plugs of this pump-head installed in a chemical plant. The plugs are exposed to a solution of basic chromium sulfate at pressures ranging up 7500 psi.

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REFERENCE BOOK SHEET

Lengths of Flats Across Bars

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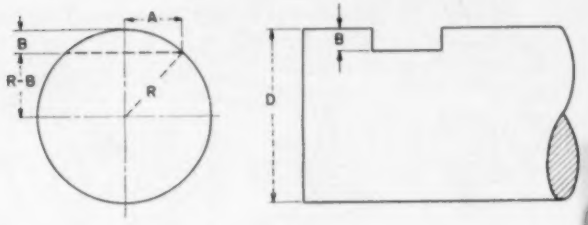
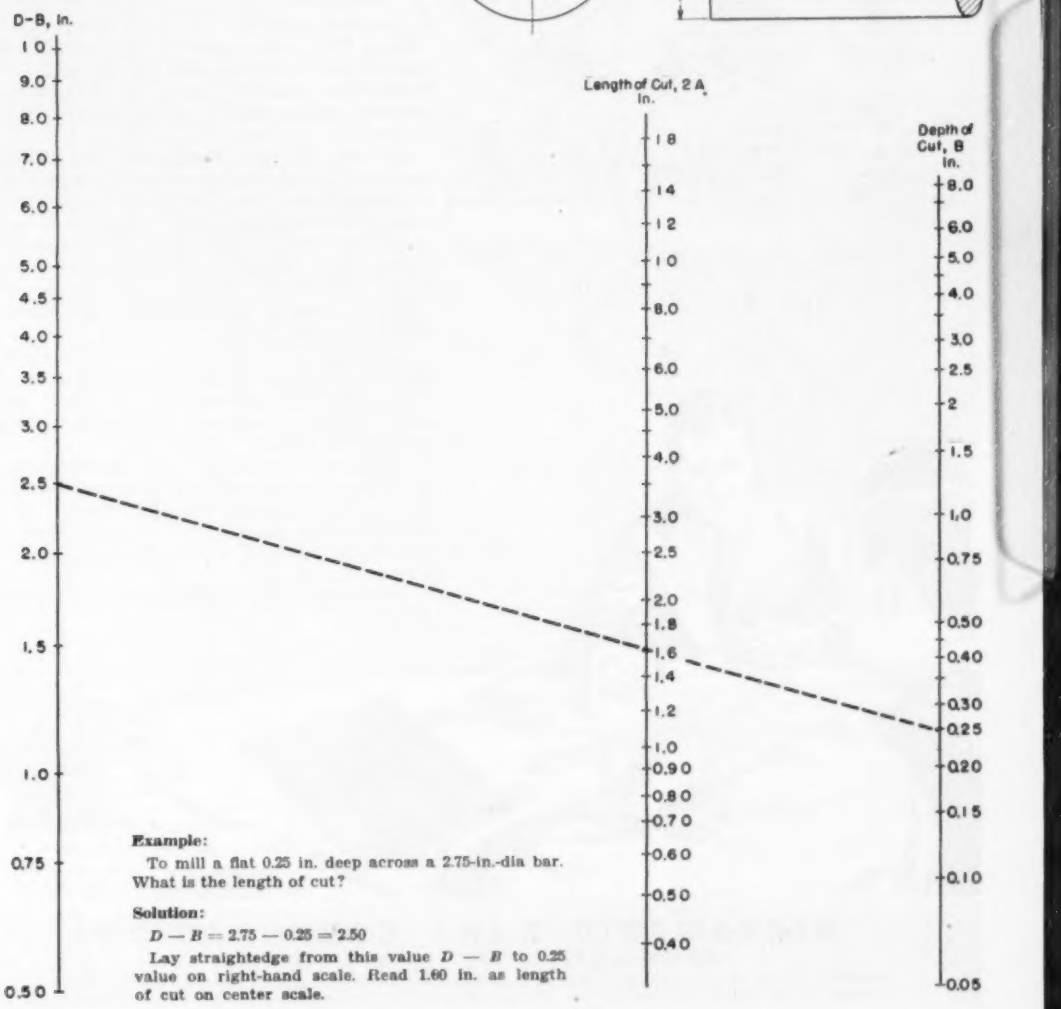
BY V. G. HOTCHKISS, Industrial Engineer, DEERE & CO., MOLINE, ILL.

$$\text{Length of Cut} = 2A = 2\sqrt{B\,(D-B)}$$





Example:

To mill a flat 0.25 in. deep across a 2.75-in.-dia bar. What is the length of cut?

Solution:

$D - B = 2.75 - 0.25 = 2.50$

Lay straightedge from this value $D - B$ to 0.25 value on right-hand scale. Read 1.60 in. as length of cut on center scale.

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Plating of Stainless Steel...I

BY JOSEPH HAAS

This summary of methods, recommendations and patents has been prepared by an expert in the field.

Operations

The following operations are presented for plating any type of stainless steel. After operation 5, choice of treatment is optional. The writer prefers the hydrochloric-acid activator.

1. Degrease with trichlorethylene degreaser or any other satisfactory method.
2. Electro-clean: 180 — 190 F; 6 volts; (a) direct, 30 sec; (b) reverse, 30 sec; (c) direct, 30 sec.
3. Water rinse.
4. Acid dip: fluoboric acid 25% — 30 sec, or hydrochloric acid 25% — 30 sec.
5. Water rinse.
6. Electro activator solution: 70 F; 6 volts; carbon anodes; (a) hydrochloric acid 50% —2 min., or (b) sulphuric acid 10% — 2 min.
7. Nickel strike solution: 70 F; 3-4 volts; 2 min.; nickel anodes.
8. Water rinse.
9. Nickel-sulphate rinse: 32 oz/gal.; pH 5.6.
10. Nickel plate: 70 — 110 F; 1.75—2 volts; 10 min.; nickel sulphate 24 oz/gal.; nickel chloride 9 oz/gal.; boric acid 2.5 oz/gal.; pH 5.6 — 5. 8.
11. Water rinse.
12. Acid copper: 70 F; 0.5 — 0.75 volts; 30 min.; copper sulphate 32 oz/gal.; sulphuric acid 8 fl. oz/gal.
13. Electro cyanide: 6 oz/gal.; 110 F; 15 sec.
14. Cyanide brass: standard brass; pH 12.2; 10-20 min.
15. Cyanide (Dupont H.S.) copper: pH 11.2 — 11.8.
16. Chromium solution: standard solution; standard operating conditions; 2-3 min.
17. Water rinse.
18. Hot water dry.

Recommended Practices for Plating Stainless Steel

METHOD	OPERATION NUMBER												
	6	7	8	9	10	11	12	13	14	15	16	17	18
1	X	X	X	X	X							X	X
2	X	X	X	X	X	X	X					X	X
3	X	X	X	X	X	X		X	X			X	X
4	X	X	X	X	X	X		X		X		X	X
5	X	X	X	X	X	X					X	X	X
6	X		X	X	X							X	X
7	X		X	X	X	X	X					X	X
8	X		X	X	X	X		X	X			X	X
9	X		X	X	X	X		X		X		X	X
10	X		X	X	X	X					X	X	X
11		X	X	X	X							X	X
12		X	X	X	X	X	X					X	X
13		X	X	X	X	X		X	X			X	X
14		X	X	X	X	X		X		X		X	X
15		X	X	X	X	X					X	X	X
16		X	X				X					X	X
17		X	X					X	X			X	X
18		X	X					X		X		X	X
19	X		X				X					X	X
20	X		X						X			X	X
21	X		X							X		X	X
22	X		X								X	X	X
23	X										X	X	X
24											X	X	X

Notes

1. Sulphuric acid, as an activating agent, is not recommended in strength over 10%, because in greater concentrations it makes subsequent plating questionable.

2. When the final coating is nickel, plating time should be sufficient to give a thickness that can be color buffed.

3. Before chromium plating on nickel, color buff nickel after a 15-min. plate.

4. In method 23 of the table, no electric current is used; merely 2 min. agitated immersion.

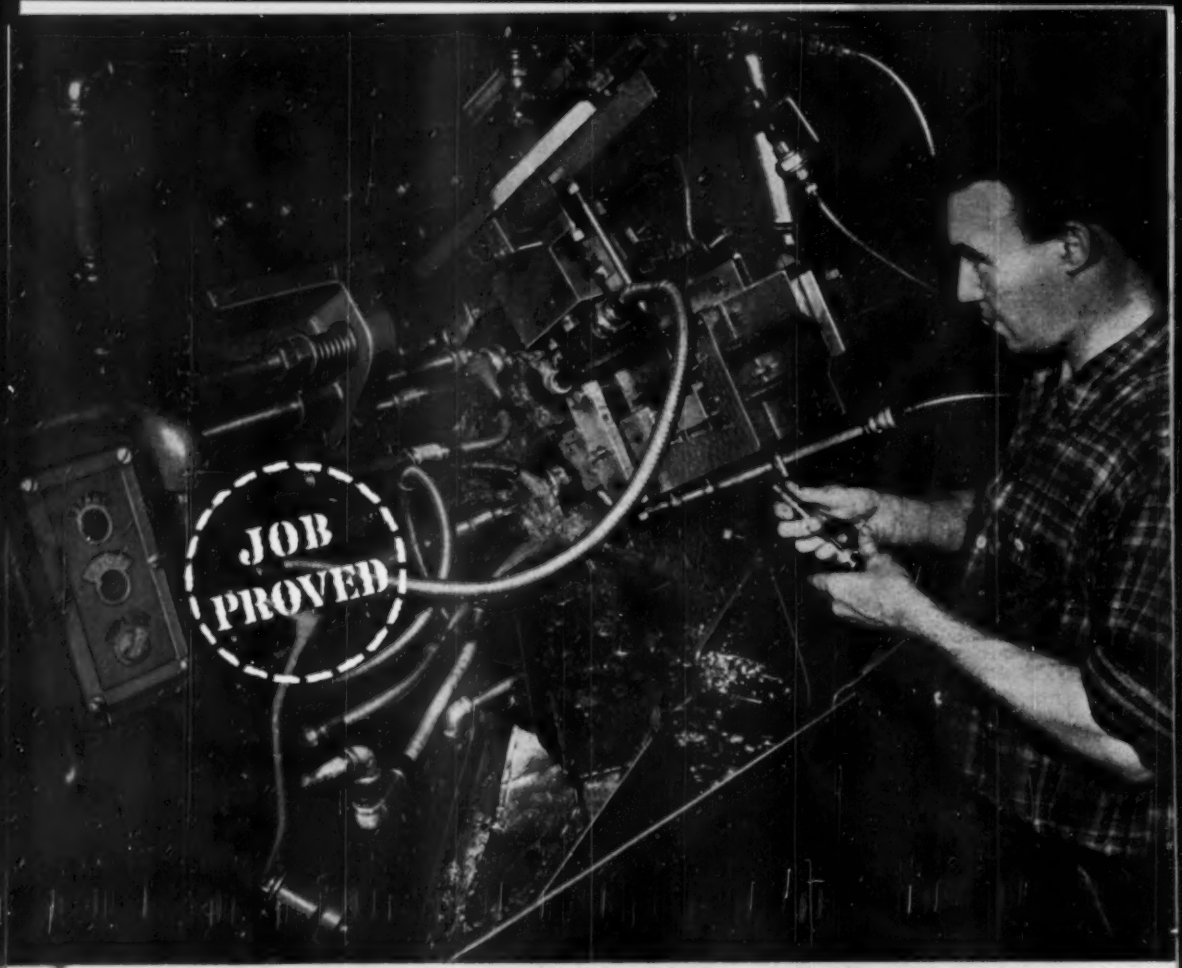
5. Chromium plating directly on stainless steel presents no problem, because the chromium solution is an activating agent.

6. After considerable experiment on plating of stainless steel, and testing the various deposits for adhesion, the writer favors after operation 5, operations 6a, 7, 8, 9, 10 in above list of operations, after which deposits of copper, Dupont H.S. copper, brass or chromium can be applied.

Literature and Patents

1. Process for Plating Stainless Steel and Articles Produced Thereby. Patent 1,501,049 issued July 15, 1924 to A. Harper. This first patent depends primarily upon the etching effect of hydrofluoric acid for adhesion of subsequent deposits. Deposition of nickel after etching is a primary requisite. Silver, deposited directly upon the stainless steel after treatment recommended by the patentee, does not adhere, when subjected to bending and heating tests.

2. Deposition of Metals Upon Stainless Steel. Haas and Unruh, *Metal Industry*, Nov. 1925, p 451. Cathodic treatment of stainless



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Plating of Stainless Steel...II

steel in 25% sulphuric acid, or 30% hydrochloric acid, 4-6 volts, 140 F, with a lead anode, which later in practice was replaced by carbon. Also later, in practice the writers used concentrated hydrochloric acid. Cathodic treatment was for 45-60 sec. This was the first published article relating to plating stainless steel, and the first to offer an explanation of the difficulty involved and a solution of the problem.

3. Silver Plating of Tableware. Elmer R. Unruh, *A.E.S. Monthly Review*, Feb. 1927. Silver plating of knives with stainless steel blades was outlined, based on experience of cathodic treatment in concentrated hydrochloric acid.

4. Plating Stainless Steel. Joseph Hoefer, *A.E.S. Monthy Review*, Sept. 1933. Paper described various dips as an aid to plating on stainless steel, best results being obtained by using a pre-dip without current, consisting of nickel chloride 16 oz/gal and 6 N hydrochloric acid, and then plating in a nickel solution: nickel sulphate, 28 oz/gal.; nickel chloride, 7 oz/gal.; boric acid, 3 oz/gal.; pH, 2.5; temperature, 125 F; current density, 35 amp per sq ft.

5. Patent application serial No. 707,502. Hiram S. Lukens, Jan. 20, 1934.

6. Method for Gold Plating. Patent 2,039,328. May 5, 1936. Hiram S. Lukens. Describes method of gold plating stainless steel pen points from a gold solution containing free hydrocyanic acid. This patent was filed as application No. 707,502.

7. A Simple Method of Nickel Plating on Stainless Steel. Donald Wood, *Metal Industry*, July 1938, p330. Outlines a cathodic treatment of stainless steel in a nickel-chloride and hydrochloric-acid solution. Recommended solution is: hydrochloric acid, 22 deg Be, 16 fl oz/gal.; nickel chloride, 32 fl oz/gal.;

This solution is operated at room temperature, from a 6-volt line, at 50-75 amp. per sq.ft. Time of treatment, 2 min.; anodes, electrolytic nickel sheet. After this treatment, resulting in a deposit of nickel, and after rinsing, other plating can be applied.

8. Process for Gold Plating Chromium Alloy Steels. Patent 2,133,995. Oct. 25, 1938. Hiram S. Lukens. Details the necessity for treating stainless steel in a hydrochloric-acid electro-pickle before proceeding with gold plating of stainless steel pens.

9. Improvements in Electrodeposition of Metals on Alloys Containing Chromium. British Patent 503,008, March 29, 1939. The Mond Nickel Co. Details, in a nickel chloride-hydrochloric acid solution, the treatment of stainless steel anodically for 2 min., and then making it the cathode in the same solution to deposit a protective coating of nickel for 6 min., after which the articles can be plated in any other solution. The method described in this patent is unnecessarily complicated to attain its objective.

10. Copper Coated Cooking Vessel. Patent 2,272,609. Feb. 10, 1942. Kennedy, Knight, and Lee, assigned to Revere Copper & Brass Corp.

11. Process of Electrodepositing an Adherent Coating of Copper on Chromium containing Alloys of Iron and/or Nickel. Patent 2,285,548. June 9, 1942. Andrew Wesley, assigned to The International Nickel Co. This patent is a repetition of the Mond Nickel patent 503,008.

12. Method of Copper Plating Stainless Steel Cooking Vessels. Patent 2,263,973. Nov. 28, 1944. Kennedy, Knight, and Lee, assigned to Revere Copper & Brass Corp. Extension of claims supplementing previous patent 2,272,609.

13. Process for Electrolytically Treating Stainless Steel Articles. Patent 2,422,903. June 24, 1947. Kenneth M. Huston, assigned to Western Electric Co. Stainless-steel articles are electrolyzed as the anode at a current density of 350-540 amp. per sq ft in a solution of 10%-60% fluosilicic acid, for a period of 20 sec to 2 min., maintaining the solution at a temperature not exceeding 85 F. After rinsing the anodically treated articles in water, they are immediately placed in a cyanide-brass plating solution of such composition as to deposit a brass plate containing 70%-80% copper.

14. Activating and Electroplating Stainless Steel. Patent 2,437,409. March 9, 1948. William M. Tucker, assigned to Eastman Kodak Co. This patent relates essentially to the method of treating and plating stainless steel as described by Haas and Unruh, using Donald Wood's nickel strike as an intermediate step.

15. Chromium Plating Large Stainless Steel Welded Assemblies. Herborth E. Head, *Plating*, March 1950, p260. Article, pictorially illustrated, explaining purpose of chromium plating and the overcoming of problems involved and encountered.

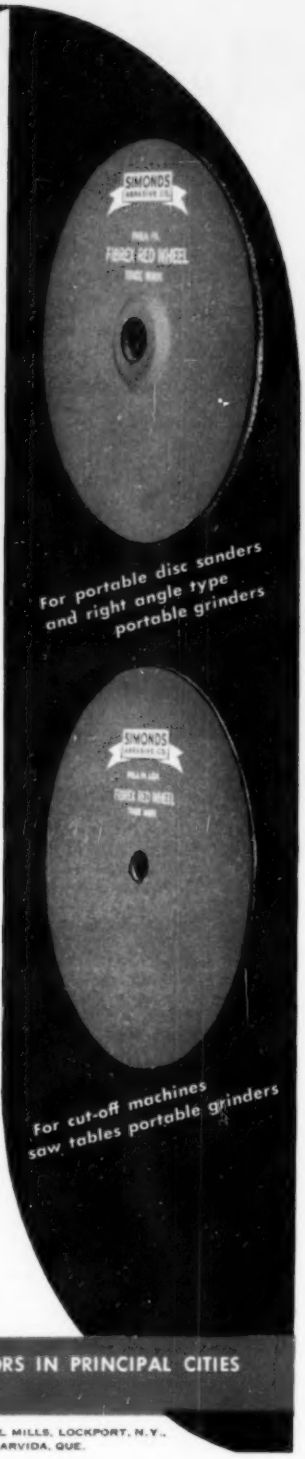
16. Adherent Electrodeposits of Nickel on Thin Films of High Chromium Alloys. Lorn L. Howard, *Plating*, April 1950, p373. Describes method of depositing nickel upon thin films of high chromium alloys.

COMMENTS ON LITERATURE AND PATENTS

1. Haas and Unruh in 1925 made the following statement: "The only satisfactory treatment was found to be, to submit the steel to the action of a direct current in an acid solution. Cyanide appears to be detrimental to the surface of stainless or high chromium." After treating stainless steel in their hydrochloric-acid activating solution, they attempted to plate in various cyanide solutions, directly upon the stainless steel, without an intermediate coating of nickel. In all cases, the result was a peeled and blistered deposit. At this time, the writer attributes this failure in cyanide solutions to the fact that the treatment of 45-60 sec. was too short. Recent research on plating stainless steel has resulted in successfully plating from cyanide solutions, after proper treatment in the activating solution, details of which are given under "Operations."

2. The plating of stainless steel, once it has been properly activated, presents no problem in any type solution. All the claims of patents of anodic treatment, then cathodic treatment in the activating solution, metal content, special electrolytes, current densities, etc., are unnecessary. For example, stainless steel, cathodically activated for 2 min. in a 10% by volume sulphuric-acid solution may be successfully plated directly in an acid-copper solution, so as to copper-clad stainless cooking ware.

However, sulphuric acid, in the opinion of the writer is not as good an activator as hydrochloric acid. This conclusion has been reached after very careful and extensive recent research on the electroplating of stainless steel.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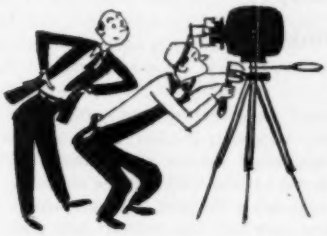
TALKING SHOP



Actor Acts

NEWSREEL COMPANIES did much filming of the recent machine-tool exhibit at the Canadian Fair in Toronto. In the midst of one shooting, a camera stalled, and examination showed one part had broken. But little time was lost—the operator who was being filmed at the time simply made a replacement part then and there—and the filming went on.

Lights at Last

REMEMBER your childhood training about turning lights off? Perhaps it is wrong—now. Maytag, at its Newton, Ia., works lab, has found recently that it is cheaper to keep fluorescent lamps burning if the interval during which they'll be off is under 2 hr. It seems that the life lost each time the lamps are turned on costs more than the power required to keep the lamps lit for 2 hr—at least in Newton. Better check your power rates on this one.

Magnetic Attraction

NON-FERROUS PARTS are supported on magnet-type carriers in a conveyorized spray-painting setup at Monroe Calculating Machine Co. A thin strip of steel is fastened to the part with a single strip of wide tape. The part then is placed on the conveyor so the strip is next to the magnet. The resultant attraction is sufficient to hold the part in place for the operation.

70% Small

ONE THREADING ENGINEER estimates that 70% of tapping and thread-gaging problems are in sizes under ½-dia. Recent design trends have been toward more smaller bolts, rather than fewer larger ones. This gives better assemblies while permitting thinner sections in designs, cuts problems and costs for fabricating and assembly.

First Furnace

SAUGUS, MASS., is restoring the first New World iron works and blast furnace. It dates from 1644. Thus far, mine detectors have located two tons of relics of the works and restoration is proceeding. Capacity of this first plant, about ten miles out of Boston, was one ton of iron a day.

A Matter of Taste

YOUNG FILIPINO engineers studying powerplant work at Canadian Westinghouse complained that they were always hungry, despite the generous supplies of food available. Dietitians spotted the trouble and gave orders that a large bowl of rice was to be served with each meal. Back in the Philippines now, the boys have not forgotten this little act of thoughtfulness and frequently refer to it in their letters. It's all a matter of taste.

Dirty Linen

AN OFFICIAL of a large Canadian drycleaning firm, visiting the Canadian Trade Fair, was attracted to a butter churn exhibited by S. A. Melotte, of Belgium. The churn is in principle a drum with three interior platforms which beat cream 240 times a minute at drum speed of 80 rpm. As a result, the churn maker may find himself making cleaning equipment as well—to wash Canada's dirty linen.

Forging Die Life

COLLOIDAL GRAPHITE treatment for forging dies is spreading. Here's the method used at Steel Improvement and Forge Co. in Cleveland, as reported by C. H. Smith, Jr., president: They heat the dies to 700 to 800 F, considerably higher than temperatures previously reported. Then they spray the cavity with Aquadag. No lubricant is used and the Aquadag treatment is not repeated until dies need repair. Die life is considerably improved, often doubled, on shallow dies, or uniform impressions. The graphite treatment doesn't provide enough lubrication for extrusion, for big dies, or for forging high-temperature alloys. Use of a lubricant defeats the effect of the graphite. Connecting-rod dies are an ideal application for graphite.

Disaster Relief

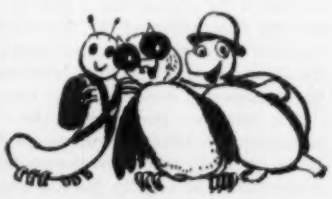
CANADIAN WESTINGHOUSE is justifiably proud of its record in the recent Winnipeg flood relief drive. Every department in the plant contributed 100% in raising $35,000 for the flood victims. Moreover, when motors were urgently needed for the pumps, Westinghouse employees voluntarily worked overtime to get them finished and on the job.

Daffynitions

SPIRITUALIST: bartender. INCOME-TAX COLLECTOR: infernal revenue man. GIRLS: what women over 40 call each other. WOLF: leer today, yawn tomorrow. BRIDEGROOM: man penalized for holding. PSYCHIATRIST: tells you what you know, in words you can't understand. REDUCING SALON: where you have everything to lose and nothing to gain. PHYSICAL FITNESS: don't give up the shape. PESSIMIST: man who buys two lifetime pens.

Metalworking Menagerie

THE WELL-KNOWN Caterpillar Club, made up of people whose lives have been saved by parachute jumps, has a pair of younger brothers: the Owls and the Turtles. Membership in the Owls is open to people whose eyesight has been saved by wearing safety glasses, in the Turtles to those whose brains are intact because of a hard hat. Membership will not be limited by industry or national boundaries. It doesn't matter whether a stray casting from a crane load or a log falls on your head. If you're wearing a hard hat, you can become a Turtle. If you aren't—well, perhaps there is a Jackasses Club up yonder.



MATERIALS REVIEW CUTS SCRAP LOSSES

By careful survey of all material rejected by inspection, actual scrap was reduced two-thirds, and production and inspection methods improved

BY A. M. SCHEERER, asst. engineering mgr. and
A. HARTMAN, project engineer
Production Models Div., Engineering Dept.
WRIGHT AERONAUTICAL CORP. WOOD-RIDGE, N. J.

IN ANY industry, even one where reasonable tolerances have to be met, there is the problem of a large number of rejects when 100% inspection is required. New, untrained, machine operators tend to ignore what seem to them "incredibly fussy restrictions" on specifications that have to be enforced by inspectors. Similarly, vendors and subcontractors sometimes supply material which does not meet engineering standards.

This problem became acute in the aircraft industry during the first days of the late war. In cooperation with the United States Air Force, Wright solved it by setting up a materials review board charged with making the decision as to the disposition of materials rejected by final inspection. These rejections included all materials, whether machined, finished, or assembled, that were found to vary from drawings or specifications.

So well has this operated that it has been responsible for salvaging two-thirds of the 18% technical rejects of all parts processed, and is now considered an economic necessity. As presently constituted, the board consists of three members, one each from the engineering and inspection departments, and one from the USAF inspection who is designated chairman.

In practice, the inspector reports every discrepancy on a special form, called a hold ticket. This is filled out in sextuplicate with all pertinent information, including part number, how many parts, and an accurate description of the deviations. Also, each part is stamped with a triangle to designate it as subject to materials review action. The six copies are distributed so materials review, manufacturing, and inspection personnel are informed at once.

Hold tickets and the rejected parts are moved into one of materials review cribs in the plant for consideration. The board's inspection member checks the ticket for completeness and accuracy, and verifies the description of the deviation. If he believes the part to be acceptable on a quality basis, he signs the three copies of the hold ticket and refers them to the engineering member of the board.

The engineer investigates the discrepancy and considers the effect on safety, performance, durability, weight, and interchangeability. Small discrepancies will usually have a negligible effect on weight, but on some reciprocating parts which are carefully balanced, weight is critical. If these requirements are unaffected by the discrepancy, the material is considered satisfactory and the engineer signs the tickets approving the part as is, or recommending corrective rework. The tickets now pass on to the USAF inspector, who reviews the two previous decisions and either accepts or rejects the material. In the case of reworkable material, final acceptance is withheld until rework is completed.

All members of the board must agree on acceptance of a part, but any one member may reject it as unusable. Either a rejection or an acceptance stamp is used to cancel the triangle previously applied.

When it has been proved later that a rework of minor workmanship errors can correct the part to the satisfaction of the materials review board, the rework becomes standard for the specific application. The two main classifications of acceptable rework so developed by Wright are plugging (for oversize holes) and chrome plating (for undersize surfaces).

Records Are Kept

The board constantly maintains a materials review record which lists the various limits of acceptability of dimensions outside the blueprint specifications in the direction of too much stock removal. Parts outside these specifications in the other direction are considered unfinished and returned to the shop. Records are kept only in materials review areas and are not available to plant personnel or vendors.

This record is an important part of the procedure, as it puts in readily usable form the information accumulated over a long period of investigation of dimensional variations and repairs. It is in a continuous state of revision as new parts are released for manufacture, and special repairs are often reclassified as standard repairs. The record is used as a reference background whenever similar variations are found on new parts, and is useful in educating new inspection personnel.

Quality Is Improved

One of the purposes of the procedure is to aid in upgrading the quality of the end product by drawing attention to recurring discrepancies, so corrective action may be taken.

An example of this involves a part which was being metallized with aluminum. The location and application was such that the deposited metal was subject to chipping out through handling in manu-

facturing. A simple change to provide cadmium plating in place of metal spray eliminated an unsatisfactory quality condition, and the operational characteristic of the part was not changed.

The engineering member of the board frequently can see and initiate helpful changes in manufacturing or inspection that will save time without affecting the part's operation. For example, parts were being referred to materials review because of failure to meet pressure-check requirements. The engineer found that the pressure check performed in the shop was repeated in the assembly department. Parts rejected by the first pressure check were experimentally tested in the assembly area and found to be satisfactory. Thereupon shop pressure-check equipment was investigated and found inadequate. Drawings were changed to discontinue the check in the shop and depend only on the one in the assembly area. This resulted in the saving of time and effort in the shop and eliminated duplication of equipment.

In another case, rubber seal rings were specified to be without flash at the parting line. This condition could not be met without costly hand trimming, and even then flash was not removed uniformly, resulting in low spots and uneven rings that were less desirable than controlled flash. Because of this, all rubber rings were referred to the review board for decision. As a result of investigations made by the board, an engineering change was made to permit a flash 0.003 in. high and 0.005 in. wide. Rings now received are accepted almost 100%, and there has been no adverse effect on engine operation.

One other example concerned a rubber seal used in a trapped location. The assembly was continually referred to materials review because the ring was exposed and the assembly was apparently made incorrectly. There was no pressure leakage, but it just did not look right to the inspector. Investigation showed that all parts were to blueprint dimensions, but the ring could be exposed under extreme tolerance conditions. An engineering change provided a ring which could never be exposed but would still effect a good seal. Changes of this type result in a saving in manufacturing and inspection time, with consequent cost reduction.

The Engineer Stays Busy

The materials review engineer performs other jobs in addition to his duties on the board. Liaison work with the inspection and manufacturing departments helps to prevent the spread of confusion and conflicting information. In addition, he assists the shop in investigating whether engineering changes can be made to facilitate parts manufacturing.

Sometimes he finds that vendors do not meet required tolerances. In such cases he advises the vendor, through the purchasing department, whether or not he should ship the parts to the plant for materials review. Final decision as to acceptability then rests with the board.

That the materials review procedure as originally set up at Wright was successful, is confirmed by the fact that it has been continued since the war with only minor changes. There is bound to be some rejection in close tolerance work, but the board keeps it to a minimum. Borderline cases, of course, are scrapped. No chance is taken of customer complaints of faulty operation. So far Wright has not had any trouble either in production, assembly, testing, or service that could be traced to the use of salvaged materials review parts.

Distribution of Copies of Hold Order

PURCHASED PARTS

1. Tub Desk (Receiving Inspection)
2. Materials Review (With material)
3. Materials Review (With material) x
4. Production Control
5. Materials Review (With material) xx
6. Inspection Department

MANUFACTURED PARTS

1. Manufacturing Department
2. Material Review (With material) xx
3. Production Control
4. Material Review (With material)
5. Material Review (With material) x
6. Inspection Department

x—Upon decision this copy forwarded to AAF Inspection.
xx—After decision this copy is returned to Quality Control if no acceptances. If any parts are accepted this copy is returned to Inspection with the accepted material for preparation of an Accepted Material Disposition Order, and then forwarded to Quality Control.

News of Metalworking

• **DECLINE IN SWISS EXPORTS** has now hit machinery industry. First quarter exports of machinery were valued at 177.5 million francs compared with 213.4 million in last quarter, 1949. Especially noticeable was decline in exports of machine tools, dynamos, electrical machinery. Swiss machine tool industry is meeting increasing competition from German manufacturers.

• **GERMAN "PEOPLE'S TRACTOR"** has been developed by Dr. Ferdinand Porscher, designer of the "people's car," in cooperation with firm of Allgaier. Tractor is equipped with an air-cooled twin-cylinder, 18-hp diesel engine. Built-in centrifugal oil purifier is said to eliminate need for changing oil. Oil-hydraulic coupling transmission permits starting in all gears. Cost: 4450 Deutsche Marks.

• **U. S. JET TRANSPORT** development through government financing is unlikely this year. $12.5-million bill to pay costs of prototype testing has grudging Budget Bureau approval—gives it an outside chance of passage this season.

• **"ECONOMY IN PRODUCTION"** contest sponsored by Ohio Crankshaft Co.'s TOCCO Div., Cleveland, was won by John Nelson, engineer at Commercial Shearing & Stamping, Youngstown. He received $1000 as first prize for his idea involving use of TOCCO induction heating equipment for brazing hydraulic cylinders used on farm and construction machinery. The application more than doubles production while reducing costs 50%.

• **ELECTRICAL PRODUCTS** will be made by Eletromar Industria Electrica Brasileira S.A. of Sao Paulo, Brazil, under a contract signed with Westinghouse Electric International. On a royalty basis, EIEB will manufacture household appliances, including vacuum cleaners, flat irons, fans and radios, fluorescent lights, single-phase and three-phase motors, and reactor-type voltage regulators.

• **SWEDISH IRON** totalling one million tons is to be shipped from Lulea in the north of Sweden to Polish ports for delivery to Polish and Czech steel mills.

Huge Presses to Spur Development Of New Extruding, Forging Ideas

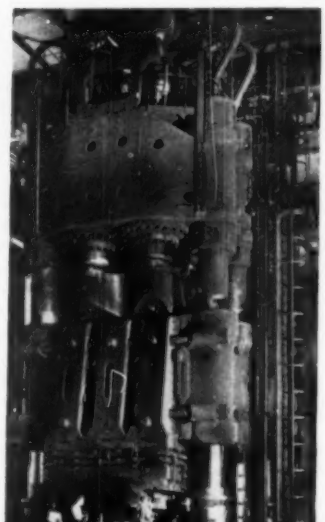
ADRIAN, Mich. — Manufacturers with good ideas for improving forging and extruding processes can now get around one of their biggest development obstacles — the high cost of equipment and research facilities.

The Air Force has set up a manufacturing methods pilot plant in the former Bohn Aluminum & Brass Corp. plant here, to which industry is invited to bring its extrusion and forging problems.

Fifteen extrusion presses now are installed, ranging in size from 1650 to 3500 tons. Four forging presses being installed range from 600 to 15,000 tons, and a 75,000-ton giant is on the way.

Presses are available for use by any company or individual who wishes to experiment with techniques and methods at no capital investment cost. The only fee is for "use time," for operating and maintenance costs.

Gerity-Michigan Corp., right across the street from the former Bohn plant, runs the facilities under an Air Force contract. G-M's operators handle press and furnace operations. Beyond that companies using the plant must supply their own technicians.



FROM ADRIAN PILOT PLANT may come 75,000-ton giant press to match this 30,000-ton press which Russia got from Germany through reparations

• **How the plan works:** The company with an idea it wants to work on gets in touch with Gerity-Michigan, talks over the project with G-M engineers and Air Force technical personnel for its feasibility and, once prints are approved, moves in with its technical representatives to collect data. Air Force technical men will be on hand to keep records of progress. Information gathered will be freely circulated among American industries by the Air Force, except for top-secret projects.

The Air Force is confident the project will pay for itself, through development of new extrusion techniques, expansion of forging method to parts hitherto considered too big to forge, new uses for extruded and forged parts based on new design concepts, broader knowledge of effects of heat, pressure and die design on such parts, and a sum-total increase in American design and production know-how.

Right now Hydropress, Inc., New York, is installing the four vertical forging presses of from 600 to 15,000 tons, obtained from Germany under the Reparations Act. Unfortunately, the Russians got the reparations plum: a 30,000-ton die forging press, plus a 12,000-ton extrusion press, both now in operation in Russia.

• **Forging in the U.S.** has commonly meant drop-hammer work. Hydraulic forging at the Adrian pilot plant means simply this: pressing the metal billet between two dies with such force that it assumes the desired shape with one stroke. Under conventional methods, the production of a 19-ft tapered wing spar cap requires 207 lb of material, of which 145 lb must be removed in 85 manhours of machine work. By using a forging press, only 64 lb of material is needed, of which only 2 lb must be removed, and in only 5 manhours of machining.

BOEING WILL USE THIS NEW ONSRUD SPAR MILL in the milling of spar beams and related parts for new Boeing Turbojet airliner. Machine has bed length of 90 ft. Traveling carriage of spar mill houses 4 cutter head assemblies. Motor units total over 200 hp. Operating under templet control, machine automatically makes wide range of milling cuts on work, including horizontal swarfing cuts up to 10° off horizontal, and vertical swarfing cuts up to 15° off vertical. Rate of feed is infinitely variable over wide range. Chip disposal is automatic. (Chicago Tribune photo)

Backlog Orders Will Carry Aircraft Manufacturers Through Part of '51

LOS ANGELES—If a generalization can be made about major aircraft producers here, it is that the year 1949 was a tooling up year and 1950 is a production year.

Only two companies of the area's four major manufacturers, North American and Northrup, have models in the tooling-up stage, and, in the case of one model, that process is about complete.

• **Backlogs** of military and commercial orders are sufficient to carry all of the firms through a portion of 1951 and in some cases beyond. Lockheed reported a $215,000,000 backorder file as of April 1, while Douglas' backlog as of the same date was $250,457,688. North American reported $283,958,395 in undelivered orders April 28, and Northrop had a $100,000,000 order file April 21. Except in the case of Northrop, these figures include those orders announced in April by the government.

While pilot models of Northrop's F89 have been produced, actual production still awaits completion of tooling for assembly line production.

• **North American** in May was tooling up for one model only, the F95A Air Force jet interceptor, and in production on the AJ1 large carrier-based attack bomber, the B45 Tornado four-jet bomber for the Air Force, the T28 Air Force advance trainer, the F86 Sabre Air Force jet fighter and making extensive changeovers on the T6 Texan trainer for the Air Force and foreign governments.

• **Lockheed Aircraft Corp.** has in production at its Burbank plant the F94 night fighter version of the F80 Shooting Star, the F80 fighter, scheduled for completion early this summer; a twin jet two-seat advance trainer for the Air Force, the Navy P2V Neptune anti-submarine bomber and $55,000,000 in commercial orders for four-engined Constellations.

• **At Douglas** plants in El Segundo, Long Beach and Santa Monica, both continuing and new orders for commercial and military aircraft were underway. The company spent most of 1949 tooling up for three models now in production. Thirty DC6's, the company's commercial transport, are also in production. Thirteen percent of Douglas' orders represented commercial sales. A continuing order for the Navy, the AD series of the Skyraider, was still underway, with over a thousand of that model produced since 1946.

Plants Bought, Merged

Hobart Mfg. Co., Troy, Ohio, has purchased **Bade Cummings Mfg. Co.** of Louisville, Ky., the latter engaged in manufacture of automobile and refrigerator hardware and also the producer of metal stampings. A number of parts for Hobart products—food cutters, mixers, scales, washers, pealers— are already being made in the Louisville area and these will be concentrated in the recently acquired plant.

Merz Engineering, Inc., has been formed through purchase of Merz Engineering Co., 200 South Harding St., Indianapolis, by Miklos Sperling of Love Machine & Tool Co., Indianapolis. Sperling will move such equipment as is necessary for manufacture of tools, dies, jigs and fixtures and their related products to the Merz location. Merz produces gages, precision aircraft products, special machinery.

Hapman-Dutton Co. has been formed through merger of Hapman Conveyors, Inc., Detroit, and C. H. Dutton Co., Kalamazoo, Mich. Two divisions of the company are Hapman Conveyors Div. at 19209 West Davison Ave., Detroit, and Dutton Boiler Div. at 630 Gibson St., Kalamazoo.

Herman Nelson Div. of American Air Filter Co., Inc., has been formed, through consolidation of the Herman Nelson Corp. New York branch office with American Air Filter. Address is Grand Central Terminal Bldg., New York.

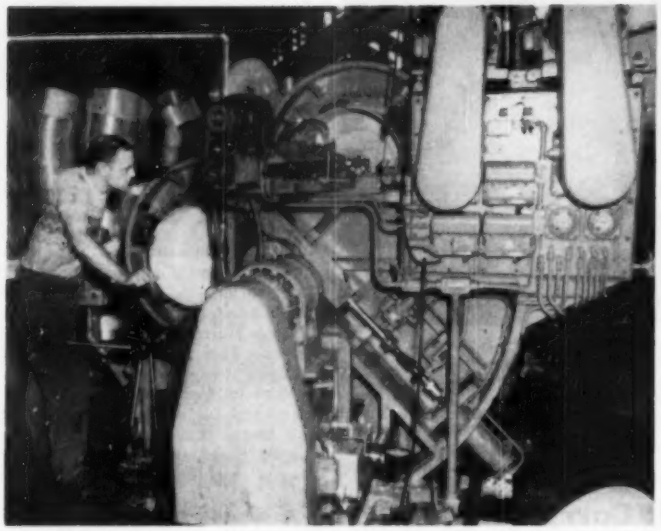
Coinex, Inc., Toledo, has been merged with **Cousino Metal Products, Inc.**, with present plans calling for Cousino continuing operations in its two Toledo plants. Products include small and medium precision stampings and coined metal parts for the automotive and home appliance industries. Hugh A. Morrison, formerly of Apex Electric Co. has been named vice president and sales manager of the merged companies.

Collins Co., Collinsville, Conn., has purchased **Warren (Pa.) Axe & Tool Co.**, with C. M. Elston of Collins assuming the presidency. The Warren firm is to continue operations independently.

How Maytag Washer Plant Got Top Output

Functional layout, modern equipment, employee training stimulate increased production rates

By BEN C. BROSHEER
ASSOCIATE EDITOR



HOLES IN BOTTOM OF CAST TUB are drilled and tapped or spot faced in this automatic three-station machine, developed by W. F. & John Barnes Co., after gasket face has been face-milled to within 0.003 in. flatness in preceding operation. Production averages 50 per hr under normal conditions. Operator only loads and unloads

INNER TUB for automatic washer, made of drawn steel, is finished in this unusual embossing and piercing die developed by Verson for use in 300-ton press. Die pierces 1056 holes 3/16-in. dia in periphery of 18-gage tub, and embosses and pierces six 19/32-in. dia holes for mounting bolts. Six press strokes are needed for each cycle, with automatic indexing between strokes. Punches are moved outward from center support so any burrs raised will be on outside of tub, where they cannot damage clothes placed inside for washing

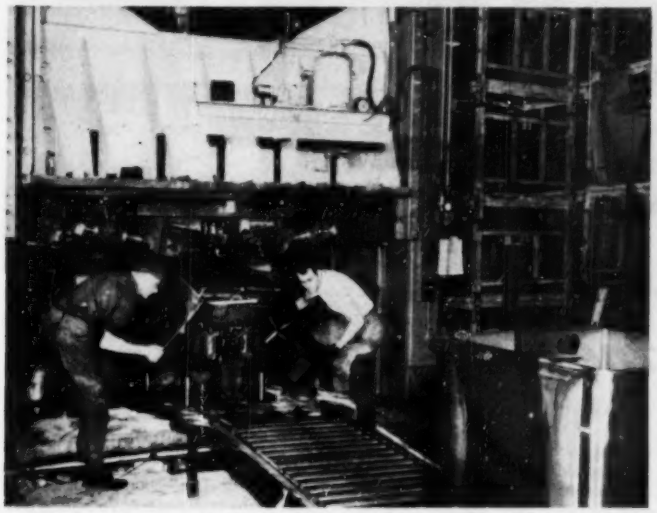
NEWTON, IA.—Daily production schedules twice have been increased materially over the original estimate of 500 per day at The Maytag Co.'s new automatic washer plant since it was put into full operation less than a year ago. This has been accomplished without the purchase of additional production equipment, and in spite of material procurement difficulties.

Increased production rates were made possible by the high production efficiency built in the manufacturing equipment purchased for the plant, the use of adequate material handling facilities, close attention to production scheduling, and an effective employee training program. Participation of production employees and supervisors in a methods improvement training course also is credited with a large share of the gain in efficiency.

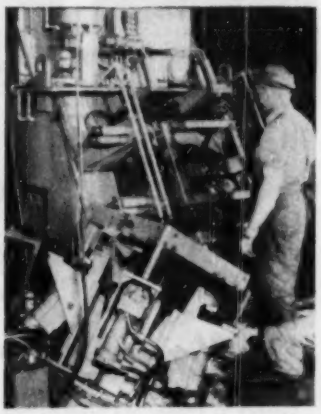
• **Maytag's new $5-million factory** for making domestic automatic washing machines has 290,000 sq ft of floorspace, all on one floor. Equipment is provided for making almost all parts for the automatic washer. A few operations on these parts are performed at the original plant, where all conventional washers are made, but the two plants are operated as independent units.

Much credit for the early achievement of high operating efficiency at the new plant is given suppliers of production, finishing and materials handling equipment by Maytag executives. When plans for the factory were completed, and suppliers of equipment were chosen, they were given full responsibility to develop and make their respective units to meet production-rate requirements. The result was a number of innovations in machine and tool design which are proving effective in use.

In the machining department, some 200 operations are performed on 55 parts, using 107 machines.



CABINETS FOR MAYTAG AUTOMATIC WASHERS are bent to shape in two-station Verson press, then placed on roller conveyor for delivery to welders. Pierced and flanged sheet first is bent at two outside positions in first die (other side of press) then passed through press to second bending die. Production averages 120 per hr when steel is available



BASES FOR AUTOMATIC WASHERS are finished in group of three automatic welding machines, a hydraulic punch unit, and a special automatic multi-spindle drill. Units shown position four legs under base piece, and weld them together (background), then punch leveling screw hole in each leg (foreground). Designed by Progressive, these units have automatic controls to insure high efficiency

Many of these machines were designed specially for the operations they perform, all are specially tooled. Sheet metal fabrication department consists of a shear area, where sheets or coiled stock are cut or slit to usable sizes, the press room, a grinding area, and a welding area. This department handles 40 to 50 tons of steel and aluminum a day.

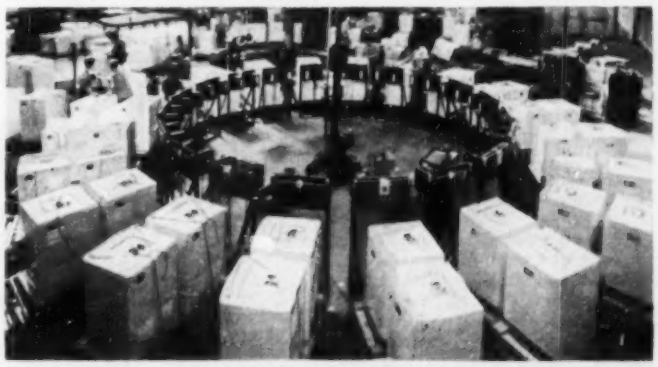
• **More than 200 operations** are performed on 70 different parts in the press room. Here the entire department was tooled for specific jobs, using all types of presses ranging from 30-ton mechanicals to 400-ton hydraulics. There are 140 different dies, ranging in value from $2,000 to $40,000, and about 85 are in constant use.

Welding machines used for assembling various parts by spot, projection, seam, and flash butt welding methods range from 50 to 300 kva capacity. Most were designed specially for the individual operations performed. Portable spot welding guns are used extensively.

The porcelain enameling facilities housed in the new plant are the first to be located in Iowa, and are reported to be one of the most efficient vitreous enameling installations in use today. More than 2000 lb of ground coat materials and 900 lb of cover (white) coat materials are used daily. Steel parts to be enameled are cleaned by pickling in an acid solution, which also deposits a thin coating of nicked to aid in bonding the enamel to the steel. Some parts are dipped in the groundcoat, others are sprayed. Groundcoated parts are fused in a gas-fired oven at 1500 F. The white cover coat is sprayed, then the parts are refired in the same oven.

Outer cabinet parts are given two coats of high-gloss enamel paint in the paint spray division, after cleaning and Bonderizing. More than 75 gal. for prime coat and 100 gal. of top coat enamel are used each day. Separate water-curtain spray booths are used for applying the two coats on parts carried through the department on a 3500-ft-long continuous chain conveyor.

• **Manual handling** is minimized by the conveyor lines which deliver finished parts to the final assembly conveyor, and by the roller conveyor lines which serve as storage areas along the final assembly conveyor.



ASSEMBLED MAYTAG AUTOMATIC WASHERS pass over two rotary test stands and through a sound room (where they are run through a cycle to discover objectionable noises) before delivery to crating conveyor. Each unit goes through two complete operating cycles while on each rotary tester, and tapes from recording wattmeters show if unit functioned properly

George T. Fraser

J. Calvin Brown

Austin E. Cole

John K. Duhigg

Names in the News

George T. Fraser has been named assistant manager of tool steel sales for Crucible Steel Co. of America. Associated for 15 years with Crucible, Mr. Fraser formerly was manager of Crucible Rexalloy sales with headquarters in Harrison, N. J.

Harold B. Ressler has been elected first vice president, Joseph T. Ryerson & Son, Inc., Chicago. He was vice president and general manager of sales, a post he held since 1932. **C. L. Hardy,** former assistant vice president, has been named assistant to the president. **Thomas Z. Hayward** has been named general manager of sales for the 13 Ryerson steel service plants.

Albert P. Hayden has been named superintendent and **John A. Herr,** assistant superintendent, of wire rope and tramway engineering, American Steel & Wire Co., Worcester, Mass.

Alexander Toben, formerly associated with Ledeen Mfg. Co., Los Angeles, and most recently with Cardwell Mfg. Co., has rejoined Ledeen to take an active part in sales and application design of Ledeen hydraulic and pneumatic actuating cylinders, as well as other equipment.

George S. Case, vice president and treasurer of Lamson & Sessions Co., Cleveland, has been elected president. **George S. Case, Sr.,** has moved from chairman of the board to chairman of the executive committee and **Roy H. Smith,** president, becomes chairman of the board. **H. H. Winterberg** was named secretary-treasurer. **A. M. Smith** and **H. J. McMahon** were named vice presidents.

J. Calvin Brown of Los Angeles, owner of the firm bearing his name in that city, has been nominated as 1951 president of American Society of Mechanical Engineers. Formal election will take place in the fall. Mr. Brown served as manager of ASME in 1943-44, and vice-president, 1945-47 and 1947-49. Regional vice presidents nominated are **Henry Kessler,** manager, Republic Flow Meters Co., New York; **Stephen D. Moxley,** vice president, American Cast Iron Pipe Co., Birmingham; **Dr. John T. Rettaliata,** Illinois Institute of Technology, Chicago; **Carl J. Eckhardt,** University of Texas, Austin. Nominated as directors-at-large: **Lionel J. Cuculiu,** New Orleans, and **Harold E. Martin,** New York.

Austin E. Cole has been elected treasurer, Illinois Tool Works, Chicago. He joined the firm in 1936. Previously, he was with Fairbanks, Morse & Co.

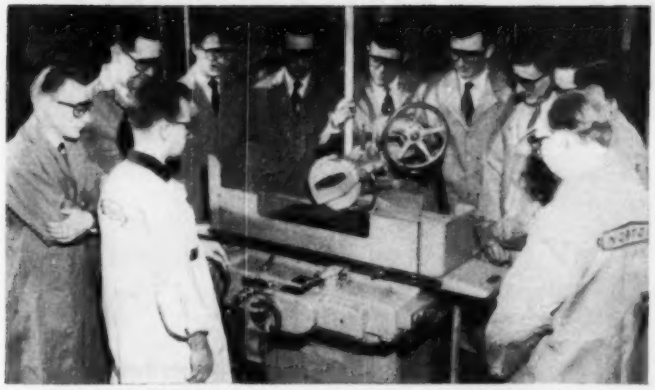
John K. Duhigg has been named assistant plant manager at Toledo, Spicer Mfg. Div., Dana Corp. He has been superintendent, Axle Div., since 1945.

E. W. Connolly has been named sales manager, Detroit district of Haynes Stellite Div., Union Carbide & Carbon Corp., New York. He succeeds **R. D. Gunther,** retired. Mr. Connolly has been with Haynes Stellite for 11 years as sales engineer in the Detroit district.

Burt C. Monesmith has become manufacturing manager of Lockheed Aircraft, Los Angeles, following resignation of **Herbert E. Ryker.**

HE'S TRYIN' TO EMBARASS TH' BOSS WITH HIS COLLEGE LEARNIN' HE KNOWS TH' BOSS NEVER GOT OUTA THE EIGHT GRADE.
YEP, THAT'S RIGHT AND THAT'S THE ONLY REASON HE'S BEEN ON TH' SAME MACHINE FOR FIVE YEARS.
SIR, IT IS NOT OVERSIZE. I HAVE ADDED A BIT TO THE O.D. INTENTIONALLY — THE LINEAR EXPANSION PER UNIT LENGTH PER DEGREE F. IS .00000636 FOR THIS MATERIAL. WOULD YOU CARE TO CHECK THE DATA AND MY CALCULATIONS ??
FLUHARTY

OMAR L. FLUHARTY has been named general superintendent of Climax Machine Co., Indianapolis. Mr. Fluharty is known to American Machinist readers for his machine-shop cartoons. Here is his latest



NORTON COMPANY'S new and fully equipped "Norton School of Grinding" at Worcester, Mass., teaches the practical application of grinding and allied abrasive processes to the company's own sales trainees and plant supervisory personnel, to its distributor salesmen, to customer personnel, and to school instructors in grinding. Here Instructor Kenneth L. Bates demonstrates surface grinding (Norton 6x18-in. surface grinder) to distributor trainees

John E. Jass has been named assistant chief engineer, Caterpillar Tractor Co., Peoria, Ill. He joined Caterpillar in 1923. Other engineering changes: **Thomas M. Logan** joins the Service Dept. as service development manager; **C. L. Kepner** succeeds Mr. Jass in supervision of design of cable controls, hydraulic controls, tool bars, allied equipment, and bulldozers; **Randall Roman** will supervise specifications for comparative analysis as used in design; **Paul B. Benner** becomes supervising engineer of all tractor chassis; **Richard S. Frank** assumes general supervision over the five supervising engineers in the Engine Design Div.; **William G. Johnson** will administer the engineering supervision of basis engine design, formerly the responsibility of Mr. Frank, in addition to heading the Applied Mechanics Div.; and **M. B. Morgan** will supervise all cooling.

J. V. Naish has been elected vice president - contracts, Consolidated Vultee Aircraft Corp., San Diego.

Frank W. Curtis has been named chief engineer, Machine Tool Div., Van Norman Co., Springfield, Mass. Formerly associated with Van Norman in a similar capacity, Mr. Curtis has for the past six years been a consulting specialist on high frequency induction and dielectric heating. He served as president of ASTE in 1941-42.

George Carleton, Jr., has been elected president, Nice Ball Bearing Co., Philadelphia, succeeding **Walter H. Rossmassler,** who is retiring. Mr. Carleton joined Nice's sales dept. in 1929, became sales manager and subsequently executive vice president. He was elected president of the Anti-Friction Bearing Manufacturers' Assn. in 1947.

Obituaries

H. O. K. Meister, 62, general manager since 1937 of Hyatt Bearings Div., General Motors Corp., Harrison, N. J., died June 10. He joined Hyatt in 1914 from the shops and engineering department of Allis Chalmers Corp., In 1920 he was named general sales manager of Hyatt and in 1929 was named assistant general manager.

James A. Phillips, 49, president of Phillips Aviation Co., Burbank, Calif., died June 7.

Fred T. Elliott, 50, former superintendent of the Wilmington, Calif., Ford assembly plant, died June 19.

Thomas Burton Van Dorn, 81, president, 1914-1923, of Van Dorn Iron Works Co., Cleveland, died May 19. He was also an officer, 1917-1929, of the old Van Dorn & Dutton Co. and Van Dorn Electric Tool Co., acquired by Black & Decker Mfg. Co.

George H. Freers has been named vice president in charge of engineering, Marmon-Herrington Co., Inc., Indianapolis.

Paul E. West has been named assistant to the vice president, Hudson Motor Car Co., Detroit. Before joining Hudson, Mr. West was assistant general manager, Armstrong Furnace Co., Columbus, Ohio, and during the war was subcontract manager for the Curtiss-Wright Corp. plant at Columbus.

James A. Brownlow has been elected president of AFL's Metal Trades Council, succeeding **John P. Frey,** retired. Mr. Brownlow has been secretary-treasurer for five years. Mr. Frey headed the federation of 14 metal trades unions since 1927.

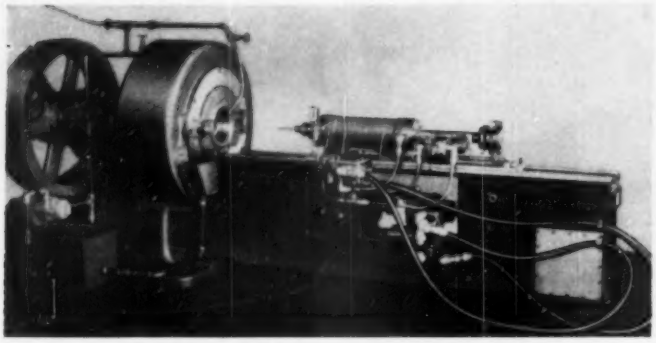
John E. Jass

George Carleton, Jr.

Paul E. West

James A. Brownlow

New Shop Equipment



No. 6½ swager with hydraulic feed mechanism. Changes in swager include better mounting of disk on face of drum to provide protection to internal working parts of the head

Three Spindle Tapers Swaged By Fenn Hydraulic-Feed Machine

Less than half as much material is required by a textile machine manufacturer for spindles now that they are swaged. Spindles are 9 in. long and were formerly turned from a 10-in. blank. The three tapers on the spindle are now swaged from a 4.5 in. blank.

The new No. 6½ Fenn swager with hydraulic feed produces the spindle in three operations. Production time is cut as is finish grinding time, because less material has to be removed from the swaged spindle in grinding.

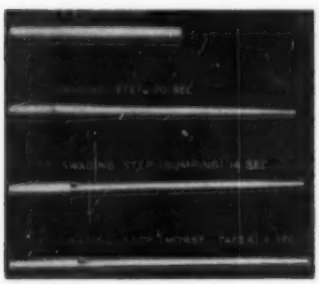
Three different tapers are required on the spindle. Material is SAE 52100 steel with an initial hardness of 90 Rb. Concentricity is maintained within 0.004 in. Blanks are fed into the swager hydraulically and work is automatically chucked as feed advances, automatically released on return. Dies are oil cooled from front and back.

The hydraulic feed mechanism has Vickers flow control providing rapid traverse and return and an adjustable feed rate. Two pumps are used: A large pump for rapid traverse at low pressure. A small pump for feed at high pressure. During feed the large pump automatically spills through to the tank without going through the relief valve to avoid heating the oil. This combination makes it possible to use a 1-hp motor.

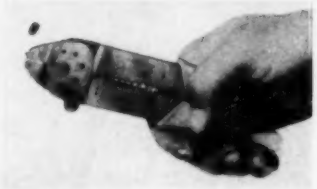
The work is held in a collet chuck that closes on advance. This chuck is mounted on a hollow rod that extends through the piston to a brake. The brake is spring loaded and adjustable, permitting the work to turn while the dies are closed but holding it while the dies are open.

The first swaging step requires 20 sec, including loading and removal. A "bumping" operation and a Morse taper follow needing a total of 20 sec.

Fenn Manufacturing Co., Hartford, Conn. FYI 31



Three steps in swaging spindles. First step produces two tapers and reduces diameter to ⅝ in. at end.



Hand Tool Shears Bolts, Crimps, Cuts, and Strips

Hand tool 49835 incorporates jaws for crimping solderless terminals with a cutting, stripping, and bolt-shearing device. The tool is designed to attach a special line of inexpensive general-use terminals and connectors known as Wire-Ends to wire in ranges No. 22 to 10.

A guillotine wire cutting and stripping arrangement on the Champ tool prepares the wire before crimping. Bolts in five sizes are cleanly sheared off, requiring no additional filing.

Aircraft-Marine Products Inc.'s Independent Distributor Div., 1601 N. Front St., Harrisburg, Pa. FYI 32

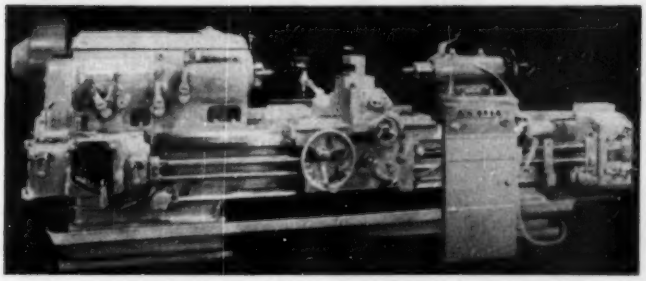
Welding Plate Shows Absorption Of Infra-Red, Ultra-violet Rays

G-S welding plates have been developed to filter out harmful ultra-violet and infra-red rays present in electric welding. They are graded for density of shade and thickness as set forth in the U. S. Federal Specifications GGG-H-211 for welding helmets and shields.

The standard size of G-S welding plates is 2x4¼ in. A 2x4⅛-in. plate is also available. Chemically compounded, these plates are said to offer extra visibility. They are priced at $0.90 each.

General Scientific Equipment Co., 2700 W. Huntingdon St., Philadelphia 32, Pa. FYI 33

Materials and Parts



Monarch Templet-Controlled Lathe Put Out in Smaller Sizes

Model N and Model NN roll turning lathes for contour turning of steel mill rolls up to 15- and 20-in. dia respectively are small scale adaptations of the "Monarch Heavy-Duty Roll Turner" (*AM*-June 2, '49, P134) introduced a year ago. The new units incorporate the same basic performance features as the original machine, but provide economies inherent in smaller machines, applied to smaller size jobs.

Keller electrical contouring controls consist of a magnetic clutch drive and feed change box, tracer mechanism, and pushbutton control from an electrical control stand which may be located convenient to the operator. Stylus of the tracer mechanism, which follows a thin metal templet mounted immediately below it at the rear of the machine, has three positions, determined by slight pressure changes against the templet.

One position creates feed toward, the second creates feed parallel to, and the third position creates feed away from the center line of the machine. As variations in templet contour change the stylus pressure against the templet, magnetic clutches are engaged, actuating cross and longitudinal screws in the rotary motion. Response to change in templet contour shape is practically instantaneous.

Model NN accommodates rolls not exceeding 20-in. body dia. Shallow passes may be taken just as fast as on any roll-turning lathe and occasional deep passes can be handled satisfactorily. Distance between centers is 132 in. The lathe provides 16 speeds from 8 to 405 rpm with an 1800-rpm motor. Drive provides 24 changes in speed, 16 through the spindle drive, from 10 to 505 rpm; 8 through faceplate, 2½ to 15 rpm.

Model N is for turning rolls up to 15-in. dia. Distance between center is 96 in. It is equipped with 16 speed headstock, heavy-duty carriage and cross-slide, heavy-duty tool post, tailstock with antifriction center, Keller controls, and one set of either 60 or 70° centers. This machine will handle an occasional deep pass.

Monarch Machine Tool Co., Sidney, Ohio FYI 34

Safety Reel Dispenses Starrett Bandsaw Stock

Safety reel dispensers hold a 100-ft coil of bandsaw stock, secured by a revolving arm, which keeps the coiled stock in place. A cutout on the side of the reel shows the approximate amount of stock remaining. Each reel is labeled to show width, type, gage, and teeth-per-inch.

The L. S. Starrett Co., Athol, Massachusetts FYI-35

... INCLUDING

Milling-machine attachment converts vertical miller into universal model .....page 114

Magnetic inspection sorts by structure, hardness, case depth, or other metallurgical difference .....page 142

Fork truck automatically provides even acceleration of motor speed .....page 144

Wheel depth control adjusts for desired cut with abrasive saw equipped for wet cutting page 148

Magnetic starter, small in size, has increased contact pressure. Silicon chutes enclose contacts .....page 152

Honing tool works with any lathe or drill and holds size to 0.0001 in. or less.....page 154

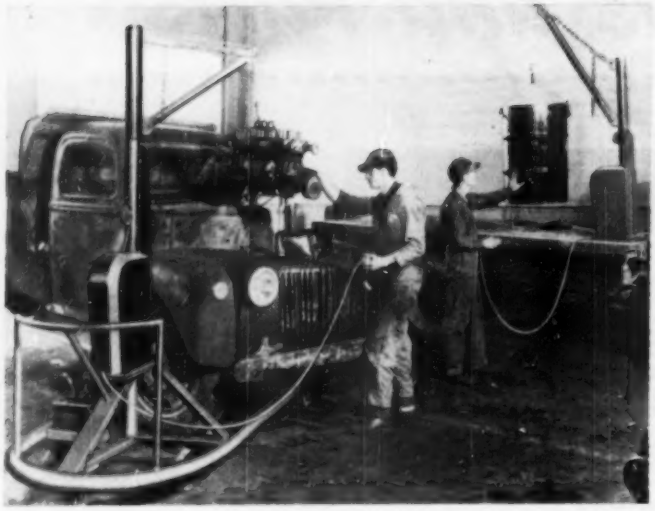
Index table has optical control for setting to accuracy of 0.0005 in. .....page 156

NEW BULLETINS for your Shop Library, including 44-page catalog giving complete details on 147 air tools.....pages 145 and 146

... and in July 24

Inspection for surface flaws with a red penetrating die works on magnetic and non-magnetic metals. Depth of flaw is indicated.

Stainless-steel tube that work hardens much slower than previous types takes severe deforming or upsetting.



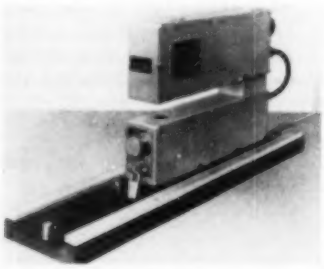
Portable Electric Hoist Holds Weights Up to 2000 Lb

The Lift-All, designed for one-man operation, will hoist, lower, stop, and hold weights up to 2000 lb. It operates on its own shop dolly or from any desired position on a truck bed and can be shifted from one mount to another by one person.

Using push-button control the operator is free to move about for load guidance. The boom, easily adjustable for height, swings completely around with its load.

The Lift-All is powered by a specially designed 6-v reversible motor permitting positive control, power up, and power down. An ordinary 6-v car battery is used on the Lift-All dolly, and truck batteries supply ample power when the Lift-All is truck-mounted. The hoist drum is equipped with a 40-ft length of ¼-in. 6-strand steel cable for long lifts.

Lift-All Equipment Co., 400 N.E. 97th Ave., Portland, Ore. **FYI 36**



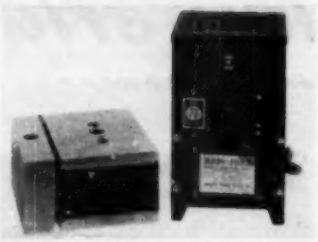
Non-Contacting Continuous Gage Measures Thickness of Materials

Radioactive isotopes are now being used for gaging continuous strip material. The beta ray continuous gage is a non-contacting unit which will measure the thickness of materials which are wet, sticky, highly polished, or soft. The gage operates in conjunction with a standard meter and will indicate any deviation in thickness of strip or sheet material such as steel, tin plate, brass, aluminum, rubber, plastics, paper, textiles, asbestos, and other compositions.

Essentially a weighing device the beta ray gage measures the weight per unit area of the moving strip by passing a small beam of beta rays through it. It may be calibrated in percentage of deviation, weight per unit area, or decimals dimensions, and readings are said to be accurate to 1%.

Normal throat depth of the gaging head is 12 in. from the centerline of the radioactive beam, but a two-piece gaging head with traverse mounting can be supplied when it is desired to scan the entire width of the sheet.

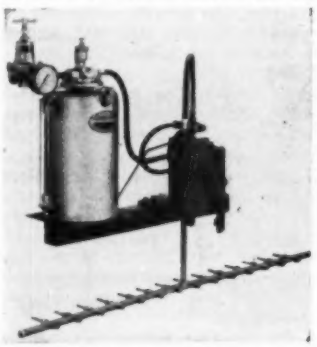
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn. **FYI 37**



Electro-Magnetic Chuck For Small Surface Grinders

A 6-in. unbroken line of magnetism, said to permit grinding uniformly parallel sides, holding work as thin as 0.011 in. is provided by the Body Flo Jr. 6-in. magnetic chuck and power supply unit. The chuck is 6x4x2 15/16 in. with companion steel parallel of the same length. The power supply unit is 4½x4½x8 in. and has a copper-sulphide rectifier, convection cooling, and a Mag-Demag switch with automatic return to the off position. The chuck holds small or large work for horizontal, vertical, or angular setups. It magnetically holds itself to the worktable or may be bolted to T-slots. Input is 110 v ac. Price for the complete unit is $87.50.

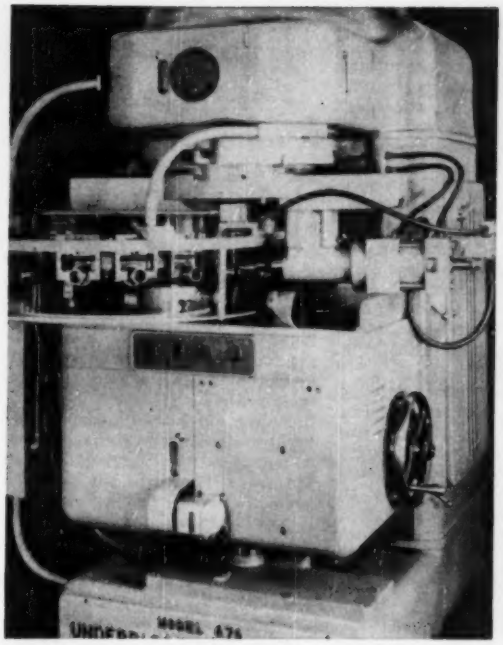
Magnetic Holding Devices, Inc., 2034 E. 22nd St., Cleveland 15, Ohio **FYI 38**

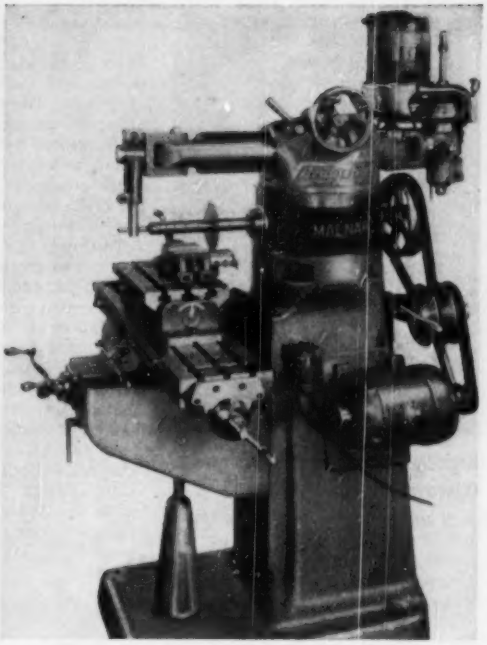


Automatic Conveyor Lubricator Oils Link, Pins, and Trolley Wheels

The manifold of this lubricator has 14 outlets, 2⅝ in. apart, to lubricate chain-link pins that are relatively closely placed. Trolley wheels are lubricated by nozzles attached to the tripping mechanism and directed straight downward. Trolleys run on an "I" beam and are spaced 37 in. apart. The oil reservoir is a 2-gal. container equipped with air regulator and pressure gages.

J. N. Fauver Co. Inc., 49 West Hancock Ave., Detroit 1, Mich. **FYI 39**





Gears Finished Automatically Without Removal From Conveyor

This system is made possible by passing the work conveyor through the machine instead of by it in the conventional manner. The arrangement permits the use of individual or multiple 870 Rotary Gear Finishing machines, operating continuously at peak efficiency. The operator merely places the gears on a conveyor as they come off the previous operation. The conveyor carries them through the finishing operation and returns them to the operator for removal from the conveyor.

Cluster gears can pass on the same conveyor through a battery of 870 machines, each of which in turn finishes a specific gear in the cluster, the conveyor providing the automatic transfer from one machine to the next.

The conveyor has full spring loaded jaws to hold the work. Light finger pressure on top of the jaws opens them and the gear is inserted. Release of finger pressure closes the jaws. Finished gears are removed from the conveyor in the same manner, although automatic release from the conveyor is possible if provision is made to handle the gears automatically after removal, avoiding nicking.

Work is carried into position above the finishing cutter. Air-operated centers on the machine engage it. Mechanical fingers come down on top of the jaws, separating them and leaving the gear free to move at crossed axis to the cutter. After the cutting cycle the mechanical finger releases to re-engage the gear in the jaws of the conveyor. Centers retract and the conveyor moves the gear out of cutting position and the next gear into position. The entire operation of indexing engagement by centers, and release of jaws takes 2½ sec.

Michigan Tool Co., Detroit, Mich.
FYI 40

Horizontal Unit Makes Bridgeport Miller Universal

The Malnar horizontal unit was engineered to make the Bridgeport Vertical Miller universal, eliminating errors in resetting from vertical to horizontal operation. The job is set up as usual and works vertically with the Bridgeport head, or the Bridgeport can be swung away and the job worked horizontally with the Malnar unit. This unit is permanently centered on zero and the Bridgeport vertical head swings back immediately to the zero position.

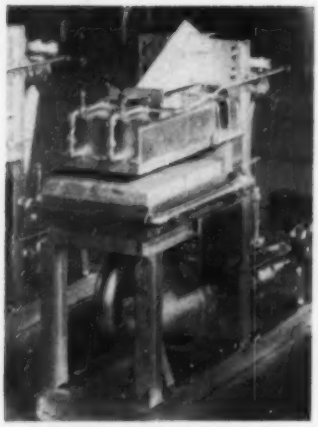
The horizontal spindle is strong enough for heavy end milling, flycutting, boring, drilling, or any other operation. Standard No. 10 Brown & Sharpe taper spindle is furnished. Special taper to individual specifications can be ordered. The speed ratio is approximately 15 to 1.

Ready for installation the Malnar horizontal unit includes: horizontal housing complete with precision spindle and Timken precision roller bearings, variable speed drive complete with pulley and belts, horizontal milling arbor supports, one 2-hp reversing switch, one 1-hp 220-440 v. 3-phase 60-c 1750 rpm ballbearing motor, motor mounting base, belt guard, and necessary mounting bolts.

Malnar Machine & Tool Co. Inc., Cleveland, Ohio
FYI 41

Did you know these pages are **F Y I ?**

The descriptions of new equipment and the listings of new manufacturer's literature that now appear in each issue of AMERICAN MACHINIST are For Your Information. And when you want more information on equipment, or a copy of the literature, there is a new, easy way to get it. Just note the FYI number on the item and circle this number on the postcard on page 145.



High-Speed End-Heating Furnace Operates on Natural Gas

End heating furnaces have a capacity of 180 1-in.-dia bars per hr. Seven bars are in process in the furnace at any one time. Burning natural gas, the furnaces are designed with maximum width of 21 inches. Each unit has a 15-in.-wide heating zone and 1,210,000 Btu per hr heat input.

Surface Combustion Corporation, Toledo 1, Ohio. FYI 42

Precisionaire Fixture Speeds Inspection of Jet-Turbine Blades

With the Sheffield 18-column Precisionaire fixture, turbine blades are checked as fast as they can be loaded and unloaded from the gaging position. No minimum or maximum master gages are required.

A carefully calibrated turbine blade is used as a master. Gage-block buildups are used to locate gaging-head mounting plates for upper, middle, and lower calibrated points of check. Gage heads are then clamped into position and, with feeler gages, the base instrument is set up for a theoretical perfect blade. Float positions indicate how much the blade being checked varies from the theoretical perfect one.

Thickness at any point can be checked by comparing the float position in an external tube with that of the corresponding internal tube. Tolerances are ± 0.0025 in. on internal points of check and ±0.0075 in. on external points.

Blades varying in width, height, or contour by more than an inch can be accommodated by the gaging fixture. Interchangeable work holders are required when root form dimensions change. Adaptations can be made for different points of check.

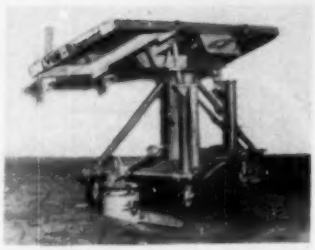
The Sheffield Corp., Dayton 1, Ohio FYI 43

Cleated Power Booster Moves Materials Up 45° Incline

Easily rolled from one job to the next, the Cleated Rapid Power Booster is manufactured in 12-, 16-, and 20-ft lengths and 12-, 16-, and 20-in. belt widths. It moves bags, cartons, crates, and similar materials at inclines up to 45°. The unit has a box-channel bed of 10-gage steel, cross braced and trussed to prevent deflection under heavy loads. Hydraulic lift raises and lowers the bed and hand-operated bevel screws control incline.

The booster is mounted on a channel-frame steel base, fitted with four 6-in. casters. Depending on type of motor, operating pitch, and bed, it handles distributed loads ranging from 260 to 550 lb.

The Rapids-Standard Co., Inc., Dept. CRPD 342 Rapistan Building, Grand Rapids 2, Mich. FYI 44

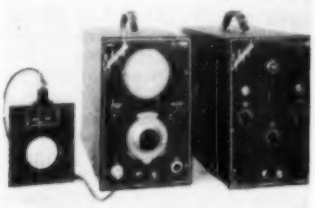


Tops Are Self-Tilting On Hydraulic Sheet-Feeding Tables

Sheet-feeding tables with self-tilting tops are for use with inclined-bed presses. Sheets are loaded on the top when it is in horizontal position. The top is hydraulically tilted to the desired angle by manipulation of pump and table supports. When the proper degree of tilt has been fixed, the table can be elevated or lowered as required to keep stock at the correct height for feeding to the press.

Adjustable stops are provided on one side of the table to keep the entire pile of sheets even for accurate feeding. Tilting arrangement is available as an optional feature on 2000-, 4000- and 6000-lb capacity sheet-feeding tables.

Lyon-Raymond Corp., 4773 Madison St., Greene, N. Y. FYI 45



High-Speed Sorter Controls Quality of Metal Parts

A magnetic principle is employed by the Cyclograph to rapidly sort by mixed analysis of the part, structure, hardness, case depth, brittleness, or almost any metallurgical difference. Testing speeds of 1 to 5 parts per sec can be attained when parts are sent through the test coil on a belt conveyor or by other fast feeding means.

The automatic Cyclograph provides both single-level and two-level sorting. It can be used to reject only parts giving a low Cyclograph reading or to reject both above and below an established range that is acceptable.

J. W. Dice Co., 1 Engle St., Englewood, N. J. FYI 46

CRANKSHAFT OIL HOLES FOR THE WORLD'S *Finest* CARS...

are drilled with LELAND-GIFFORD DRILLING MACHINES

ONLY a few ounces of metal removed per car, but the thousands of miles of oil holes drilled each year with Leland-Gifford Drilling Machines help keep America's cars and trucks running smoothly. Leland-Gifford *Step by Step* Hydraulic Feed Drilling Machines are preferred equipment for drilling oil holes in crankshafts and connecting rods for automobile and other engines . . . in fact for drilling all deep precision holes where accuracy of diameter, depth and placement is essential. If you drill holes more than four diameters deep, make sure you are drilling them with the greatest possible speed, accuracy, efficiency and economy. Investigate the Leland-Gifford *Step by Step* method. Write today for complete information.

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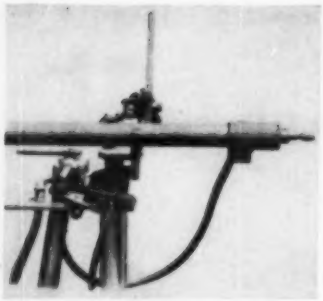
CHICAGO 6, 565 W. Washington Blvd.; DETROIT 26, 1033 Dime Bank Bldg.; CLEVELAND 1, P. O. Box 5047, NEWARK 2, Industrial Office Bldg.; ROCHESTER 4, Commerce Bldg.; LOS ANGELES 14, 724 So. Spring St.

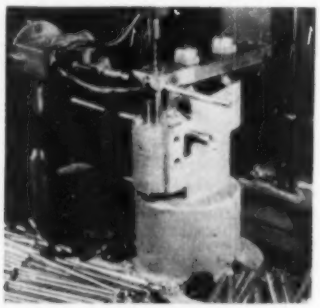


Automatic Bar Feed for Screw Machine, Turret Lathes

The OK Specialty bar feed is constructed to handle 12-ft stock bars of all shapes and sizes and will feed any required length to the stop. It permits use of exact size polished stock, thus saving additional operations. Bar-feed tube is adjustably mounted on two tripod standards. The unit operates on very low air pressure; a ¼-hp compressor will usually handle the job.

The pneumatic feed tube automatically positions and aligns stock bar into the machine-tool spindle. Air pressure therefore does the work formerly done by the operator or mechanical feeding devices. Because the stock is fed without surface contact, waste due to scratching or marring of stock is cut to a minimum.

OK Specialty Co. Inc., 910 West Lake St., Chicago 7, Ill. **FYI 47**



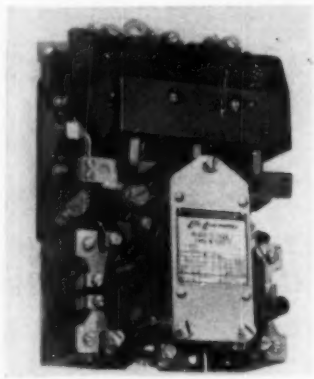
Cross-Drilling Fixture Cuts Handling Time to Minimum

A wide range of cross-drilling applications, both short and long run are handled by the No. 4 Universal cross-drilling fixture, eliminating the necessity of tooling for each job. High production is said to be obtained through ease of changeover, setup, loading, and unloading. Handling time has been cut to a minimum.

This fixture handles No. 54 through ¼ in. (bushing range). Four basic double-ended bushing plates with removable bushings cover this range. Parts handled range from 7/32- through ½-in. OD. The support stud on the fixture adjusts in the vertical plane and different sizes of notched Vees in the top plate insure proper clamping of parts of varying dia.

A spring kick-out is furnished to automatically eject the part after the drilling operation. The kick-out actuating rod is also used on Snow drilling machines to allow insertion of the part to contact a Micro switch and start the drilling and clamping cycle when the part has been properly positioned.

Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill. **FYI 48**



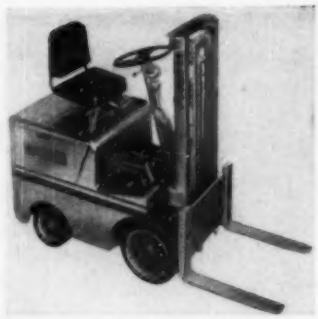
Non-Reversing Magnetic Starter Has Only One Moving Part

The a-c magnetic De-ion Life-Line-starter is designed for either across-the-line starting of squirrel-cage induction motors or as a primary switch for wound rotor induction motors, and is said to provide complete protection of motor, machine, and operator.

The starter has only one moving part, a "see-saw" lever balanced on a knife-edge bearing or center fulcrum. It cannot jam or stick, and a positive-action kick-out spring insures uniform operation. The De-ion operating principle extinguishes arcs in a half-cycle or less.

The starter is available in NEMA sizes 0 through 4 and can be applied to all integral horsepower motors up to 100 hp. It is supplied in standard a-c voltage ratings from 110 to 600 v at 60, 50, and 25 cycles for 3-phase, 2-phase 4-wire, and single-phase operation.

Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa. **FYI 49**



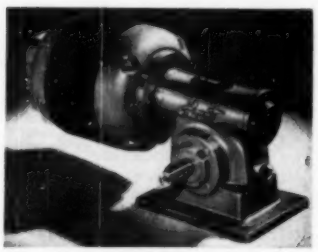
Electric Fork Truck Incorporates Automatically Accelerated Control

Electric battery-powered Trucloader 1000-lb fork-lift truck provides automatically accelerated control as standard equipment. This is power controlled through a master switch in turn controlled by an automatic timer to provide even acceleration of motor speed.

Control is non-plugging and direction of travel cannot be changed until motor comes to a full stop. A deadman brake is operated off the drive shaft of the drive motor and sets automatically whenever the driver's seat is vacated.

Lift heights are available in a range from the standard 84-in. model with over-all height of 61 in. to 130-in. model with over-all height of 84 in. Steering mechanism is designed for use with the pivoted steering axle and kickback is eliminated.

Clark Equipment Co., Industrial Truck Div., Battle Creek, Mich. **FYI 50**



Right-Angle Gear Motors Put Out in 1/6- to 5-hp Ratings

Output speeds from 17.5 to 302 rpm and ratios of 5 4/5:1 to 100:1 can be obtained by this line of Abart gearmotors. Units can be mounted in any position and torques are all taken by a semi-steel gear case. Gears are of nickel bronze and worms are integral with shaft, hardened and precision ground.

Abart Gear & Machine Co., 4828-36 W. 16th St., Chicago 50, Ill. **FYI 51**

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NEW BULLETINS

MACHINES AND ATTACHMENTS

1 GEAR SHAVERS—*National Broach and Machine Co., Detroit 13, Mich.* 12-page catalog on "Red Ring" products describes shaving machines, gear chamfers, grinders, fixtures, elliptical tooth forms, and broaching practice.

2 MACHINE TOOLS—*Botwinik Brothers of Mass., Inc, Worcester 1, Mass.* 24-page catalog contains general information on plant facilities, rebuilding of machine tools, and purchasing department for new machines. A list of rebuilt machines available in stock is included.

3 HYDRAULIC PRESSES—*M & N Machine Tool Works, Clifton, N. J.* 4-page bulletin 102 contains general discussion and illustrations of different-size presses. Capacities and specifications are included.

4 POWER SHEARS—*Cleveland Crane & Engineering Co., Wickliffe, O.* 8-page catalog 3011 describes features of Steelweld Pivot-Blade shears, discusses strip distortion, and contains a table of clearance dimensions and specifications.

5 LATHES—*Hardinge Brothers, Inc., Elmira, N. Y.* 6-page pamphlet illustrates and describes typical parts of a lathe. Specifications, standard and additional equipment available are included.

6 PRESSES—*Hydropress, Inc., New York 22, N. Y.* 12-page folder describes a rubber-pressure, deep-drawing method known as Marform. A cost analysis comparing different methods of metal forming, and illustrations of presses are included in the material.

7 POWER SCREWDRIVERS—*Detroit Power Screwdriver Co., Detroit 16, Mich.* 44-page catalog presents screwdrivers, fixtures, hopper units, nut drivers, and special assembly machines. Detailed drawings of machines and screw types are included.

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FREE shop calculators and data sheets
FREE information from advertisers
FREE advice on metalworking problems

8 EXTRUSION PRESSES—*Lake Erie Engineering Corp., Buffalo, N. Y.* 8-page bulletin has information on extrusion presses for lead, lead-embossing, non-ferrous metals, and carbon materials.

TOOLS AND ACCESSORIES

9 AIR TOOLS—*Buckeye Tools Corp., Dayton 1, O.* 44-page air-tools catalog contains complete specifications on 147 types and models of portable, air-operated tools and information on several accessories.

10 ELECTRIC TOOLS — *Portable Electric Tools, Inc., Chicago 20, Ill.* 12-page catalog gives complete specifications on all portable electric tools and information on their design and construction.

11 DRILLS—*National Twist Drill & Tool Co., Rochester, Mich.* 8-page pamphlet covers high-speed-steel and woodboring drill sets including sizes and prices.

12 DIES—*Adams Carbide Corp., Horsham, N. J.* 4-page bulletin has details and specifications on standard wire-, bar-, and tube-drawing dies. Tolerances are discussed, and wire drawing, heading, and allied operations are covered.

13 STARTERS—*Furnas Electric Co., Batavia, Ill.* 16-page catalog 50 describes magnetic starters, contactors, 4-, 6-, and 9-pole relays, and various accessories.

14 STEEL STAMPS—*M. E. Cunningham Co., Pittsburgh 19, Pa.* 4-page bulletin considers types of industrial marking stamps for tool-steel brands, hot and cold billets, ingots, slabs, dies, molds, and other heavy and light-duty marking.

15 INSTRUMENTS — *Perkin-Elmer Corp., Glenbrook, Conn.* 8-page "Instrument News" is a bulletin published quarterly. The Spring issue contains articles on flame temperature measurement, hospital-laboratory instrumentation, and abstracts of current literature on electro-optical instruments.

16 SAW BLADES—*Henry G. Thompson & Son Co., New Haven, Conn.* 4-page folders describe and illustrate hack- and handsaw blades with sketches of applications, hints on metal cutting, and general-interest information.

HEAT-TREATING AND WELDING

17 FURNACES — *Lindberg Engineering Co., Chicago 12, Ill.* 8-page bulletin 330 depicts complete line of sintering furnaces. Included is a discussion of atmosphere generators, mesh-belt furnaces, and roller-hearth furnaces.

18 ELECTRODES—*Metal & Thermit Corp., New York 17, N. Y.* 16-page catalog lists types of mild-steel arc-welding electrodes. Weld-metal analysis, physical properties, and other useful material needed in the selection of electrodes is included.

PLANT-SERVICE EQUIPMENT

19 ELECTRICAL ENCLOSURES — *Kirk and Blum Mfg Corp., Cincinnati 25, O.* 16-page booklet presents sheet-metal enclosures for electrical panels of all kinds. Control desks, electrical cabinets, control panels, test stands, and louvres are among the items illustrated.

20 DUST SUPPRESSORS—*Whiting Corp., Harvey, Ill.* 4-page bulletin FY-167 contains illustrations and write-ups on Hydro-Clone installations, which operate on the theory of wetting air and exhaust fumes to reduce dust particles. 2-page Bulletin FY-166 describes the functions and gives the dimensions of two sludge-settling tanks.

21 SPEED CONTROLS — *Link-Belt Co., Chicago 1, Ill.* 8-page booklet No. 2349 covers a new line of automatic speed controls operating electronically, pneumatically, hydraulically, or mechanically.

22 MOUNTING PADS—*Western Felt Works, Chicago 23, Ill.* 12-page booklet shows typical applications and describes felt mounting pads.

23 AIR CONDITIONERS — *General Electric Co., Bloomfield, N. J.* 12-page catalog PM79-0100 covers a complete line of packaged air conditioners, including a cutaway drawing showing how a unit operates. Standard ratings, conditions, and dimensions are shown.

24 LIFT TRUCKS — *Barrett-Cravens Co., Chicago 9, Ill.* 8-page bulletin on a new type of hydraulic, one-man lift truck contains sketches and photos.

PARTS AND MATERIALS

25 FLEXIBLE HOSE—*Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.* 4-page folder introduces newly designed mechanical fittings for flexible-metal hose.

26 FLAT STOCK — *Pittsburgh Tool Steel Wire Co., Monaca, Pa.* 4-page bulletin describes a line of precision-ground, oil-hardened flat stock.

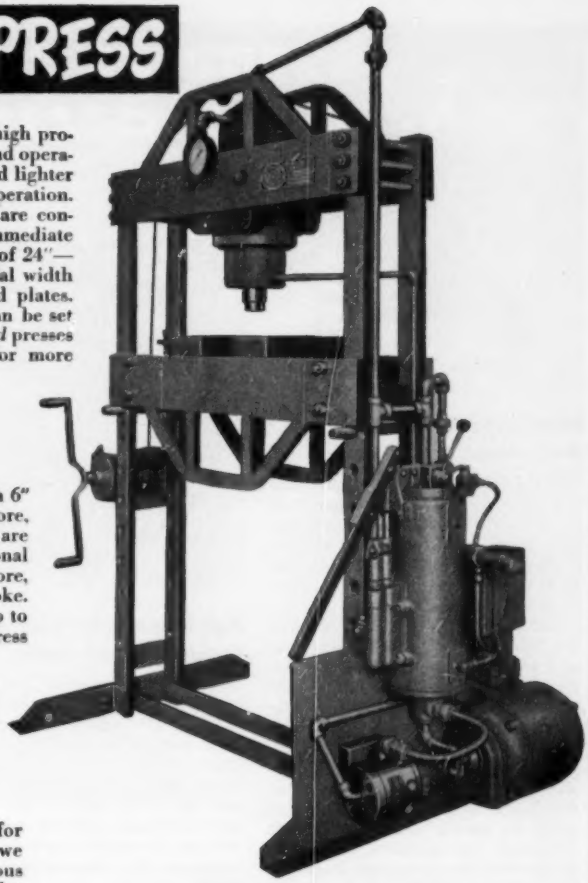
27 LUBRICATION SYSTEM—*The Farval Corp., Cleveland 4, O.* 8-page bulletin presents studies in centralized lubrication from industry.

28 NUT RETAINERS — *Tinnerman Products, Inc., Cleveland 11, O.* 8-page folder contains data on Speed Grip nut retainers, and sketches and tables give dimensions of holes, retainers, and nuts.

29 SYNCHROS—*Arma Corp., Brooklyn 32, N. Y.* 16-page booklet covers electromagnetic units for indicating angular position. Outline drawings and specifications for six miniature units are included.

30 AIR CYLINDERS—*Lindberg Engineering Co., Chicago 12, Ill.* 16-page bulletin 731 describes and illustrates a complete line of cylinders with specifications and drawings of six mounting types.

LOOK AT THIS PRESS



It's designed to provide industry with low-cost, high production units that are highly flexible in design and operation ... relieving heavier presses of short runs and lighter work. Presses are practically fool-proof in operation. Frame is extremely rugged. Fingertip controls are conveniently located at hand level. Available for immediate delivery, in standard width (between uprights) of 24"—31"—36"—42" respectively. Available in special width up to 72" at small additional cost. Movable bed plates. Pumping unit has by-pass relief valve which can be set at any pressure up to press capacity. *All Standard* presses equipped with 2-speed built-in hand pumps for more sensitive and versatile operation.

READ THESE "SPECS":

CYLINDERS: *Standard Models* furnished with 6" bore, 7½" stroke—spring return type; also 5" bore, 7½" stroke—spring return type. Above presses are *standard.* Following can be furnished at additional cost: Double Acting, 6" bore, 7" stroke; 6" bore, 11" stroke; 5" bore, 7" stroke; 5" bore, 11" stroke. Special long stroke cylinders also available, up to 48" in length, for incorporation in suitable press frames of our make.

PUMPING UNITS: These units can be supplied in various volumes and pressures, in a total of 13 combinations.

CHECK THESE USES:

There are so many everyday production uses for these versatile KRW Hydraulic Presses that we have lost count. Here are a few of the more obvious ... blanking, forming, bending, broaching, straightening, stamping, embossing, numbering, upsetting, laminating, pressing and hot or cold forging. KRW Engineers are daily developing other uses. If you have only a vague idea of how these presses might be used in your plant, let us have it in a rough form. We'll do the rest.

BEAT THESE PRICES*:

Depending upon capacity of pumping equipment, prices of Standard model motor driven hydraulic presses are as follows, F. O. B. Factory: 25-ton press from $727.00 to $992.00. 50-ton press from $806.00 to $1058.00. 60-ton press from $1070.50 to $1135.00. 75-ton press from $1198.00 to $1258.00. All motors in the above units are 220/440 volt, 3 phase, 60 cycle. Any change in motor specifications is extra. **Subject to change without notice.*

K·R·WILSON

215 MAIN ST. · BUFFALO 3, N. Y.

MAIL THIS COUPON

K. R. WILSON, 215 Main St., Buffalo 3, N. Y.

Please send me complete information on KRW Motor Driven Presses as follows:

☐ 25-ton ☐ 50-ton ☐ 60-ton ☐ 75-ton presses

☐ motor drive conversion unit ☐ Press Cap.

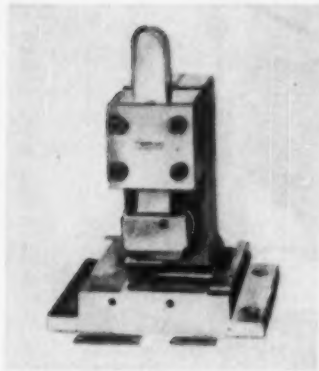
Serial No. .....

Name .....

Address .....

City and Zone ..... *State* .....

11

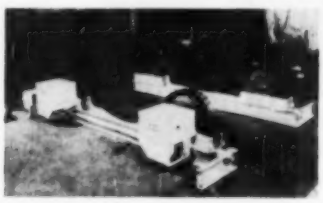


Hand Stamping Fixture Marks Metal Name Plates

Model SF-100 hand stamping fixture is made of special Mecco Safety Steel to prevent spalling, mushrooming, and injury to personnel. It can be fabricated to order for processing one or a group of name plates, checks, or other flat metal objects.

The chase section in the bottom of the holder has adjustable horizontal and vertical gages for stamping on any required panel. Gages are locked and adjusted by standard thumbscrews or setscrews and can be made in styles to suit round, square, rectangular, or special shaped plates. The hardened and precision-ground typeholder is pulled away from the plate by spring return after each stamping. The holder arm operates on a swivel which swings it upward when type is to be changed.

M. E. Cunningham Co., 95 E. Carson St., Pittsburgh 19, Pa. FYI 61

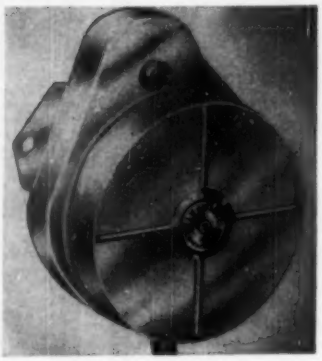


Endless Belt Turns Light Tanks During Welding Operation

The construction of TracTred turning rolls lends itself to incorporating a continuous track conveyor system for the assembly, welding, and grinding of tanks. Hoisting is completely eliminated.

The belt provides 68 to 105° of uniform contact on the bottom side of the tank. Infinitely variable speeds from 0 to 100 ipm are obtained through Graham transmission. Two clutches, one on either side of the power unit, are actuated by solenoids. One end is driven at a time thus keeping the roller chain track tight on the bottom. Reversing switch energizes one clutch.

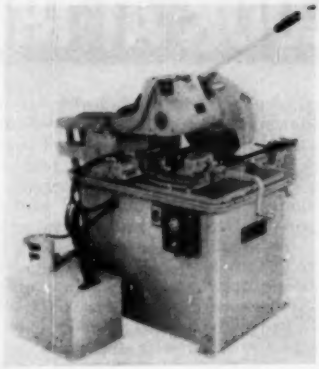
Aronson Machine Co., Arcade, N. Y. FYI 62



High Torque, Quiet Operation Combined in Timer Motor

Synchronous-hysteresis ac timing motors provide high starting and running torque and quiet operation. They run at full synchronous speed over a wide range despite variations up to 25% in line voltage. The motors have slow-speed rotors, shaded-pole starting, capillary lubrication, and are of welded construction.

The A. W. Haydon Co., Waterbury, Conn. FYI 63

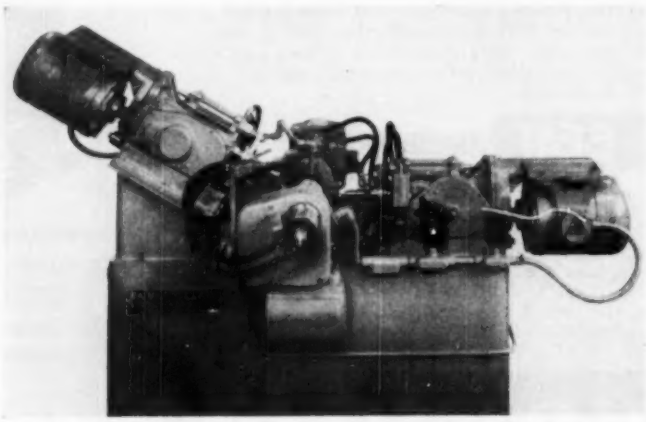


Wheel Depth Control Added to Metal Cutoff Machine

An improved method of adjusting depth of cut has been added to the Stone Swing-Cut metal cutoff machine in the form of a wheel depth control which is arm operated from the operator's normal position. This machine is fully equipped for wet cutting. Re-circulating pump, tank, hose connections, and removable splash guards are incorporated in the basic unit.

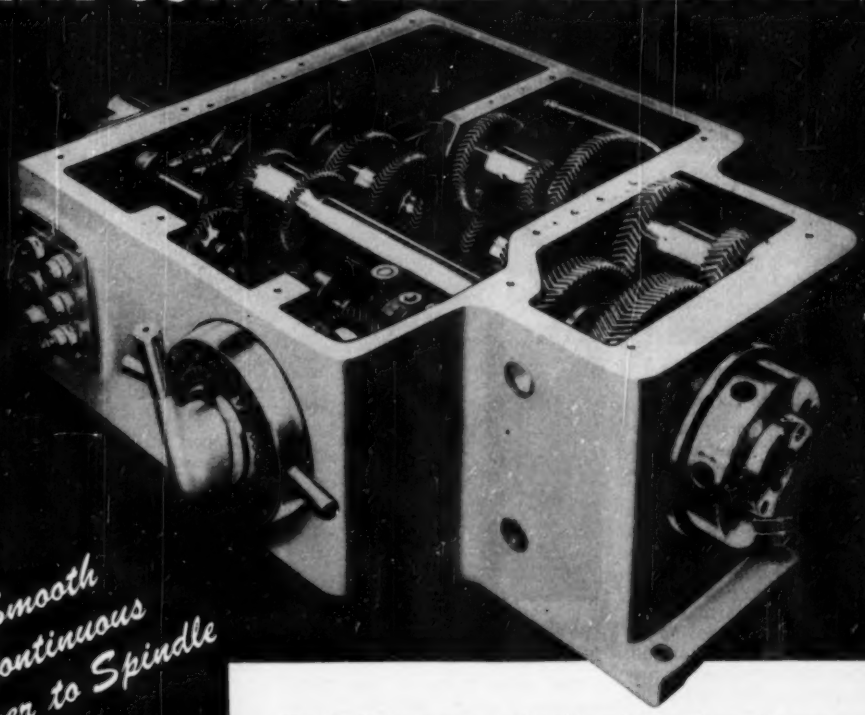
Flow of cutting fluid is controlled by the action of the cutting head. An adjustable work stop can be used for cutting of multiple pieces up to 24 in. in length. The machine can be equipped with an air-activated self-centering vise, either hand or foot controlled.

Stone Machinery Co Inc., 533 Fayette St., Manlius, N. Y. FYI 64



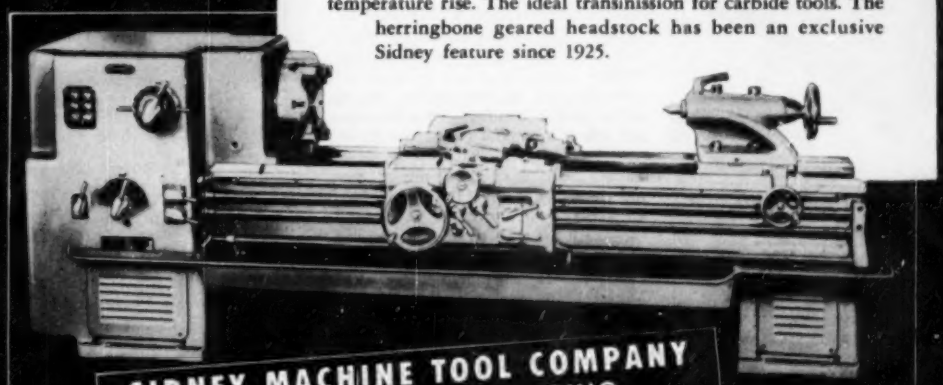
AUTOMATIC INDEX MACHINE incorporates two Millholland automatic units mounted horizontally at right angles and a third on an angle around the work. A series of 12 holes is drilled around the periphery of a flanged bushing and 24 holes are drilled in the flange end. Part is held in an air-operated collet chuck mounted on an automatic indexing spindle. Production is 150 to 320 per hr.—*W. K. Millholland Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.* FYI 65

SIDNEY'S 32 SPEED DIAL CONTROLLED HEADSTOCK

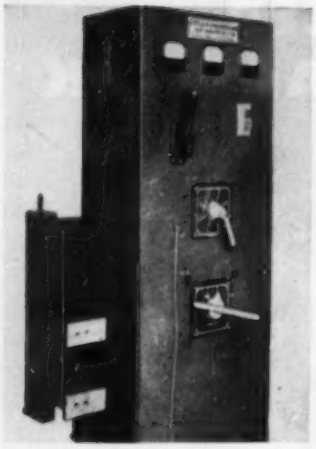


Smooth Continuous Power to Spindle

The herringbone gears in the Sidney headstock provide more tooth contact resulting in greater strength, smoother action with end thrust eliminated through the double opposed helix angles. Accurate tooth contour, gradual engagement and oblique lines of contact assure correct tooth action and reduces wear to minimum. This headstock also features a spindle mounting which automatically compensates for expansion caused by temperature rise. The ideal transmission for carbide tools. The herringbone geared headstock has been an exclusive Sidney feature since 1925.



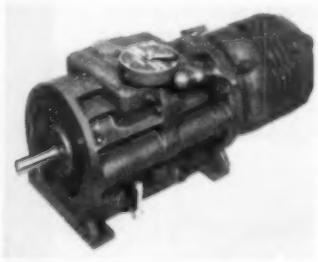
SIDNEY MACHINE TOOL COMPANY
SIDNEY Builders of Precision Machinery Since 1904 OHIO



Heating Transformer Rated at Low Voltage, Heavy Current

Low-voltage, heavy-current transformer, complete with control panel, is available in a wide variety of kva capacities up to 500, and in any required combination of voltages and frequencies. Unit shown has 40-kva capacity for 440-v supply and has secondary voltages ranging from 25 to 100 v with secondary current up to 1600 amps. By suitable arrangement of top changing switches, any one of 16 voltages may be selected at will. All switches are interlocked to prevent their operation with load on the transformer.

Eisler Engineering Co. Inc., 750 S. 13th St., Newark 3, N. J. FYI 66



Variable-Speed Transmission Employs No Perishable Parts

Speeds from maximum to zero can be obtained on the Model 300 infinitely variable speed transmission. Designed like a speed reducer, it is self-lubricating, all metal, with no perishable parts, and combines speed reduction and infinite speed variation in a single housing.

Lever or micrometer controls are said to make possible setting of speeds with hairline accuracy. Mechanical, electrical, or pneumatic remote controls are available, all suitable for automatic speed control of metering or proportioning processes; synchronization of conveyors, winding, registering, pumping, feeding, and similar applications. Model 300 is available is sizes from 1½ to 3 hp and can be obtained without motor or with built-in motors of various types.

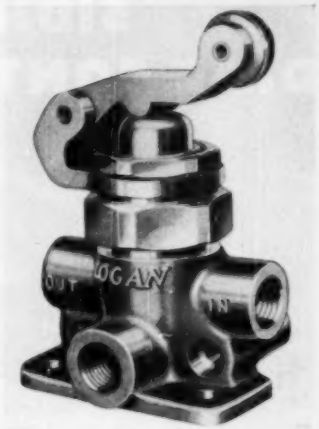
Graham Transmissions, Inc., 3754 N. Holton St., Milwaukee 12, Wis. FYI 67

Spiral Blade on Bandsaw Presents 360° Cutting Edge

The spiral blade on this Tyler bandsaw presents a 360° cutting edge which cuts smoothly in any direction, permitting the operator to cut and back out of any pattern or shape without turning the material being worked on. Both spring-tempered and hardened-spiral blades are available. The hardened blade (81 Rockwell C) will cut through almost any material—steel, wood, foam rubber, Masonite, Plexiglass, and leather included. The spring-tempered blade cuts all of the above except ferrous metals.

Slicing at a continuous angle, spiral blades do not tear the material nor leave a ragged edge. The Tyler saw is available in two models: Model 100A, with 12-in. throat, 8½-in. clearance under the guide bar, 4-in. blade-tension adjustment and table tilt of 45° to the right and 5° to the left. A 1/3-hp motor is used. Model 500A is the same as Model 100A except that it employs a ½-hp motor and presents a combination of variable-speed drive and planetary transmission, providing a selective speed range of 70 to 5000 fpm.

Tyler Mfg. Co., Los Angeles 45, Calif. FYI 68



Air-Control Valves Designed For Side Or Base Mounting

Two-, 3-, and 4-way, two-position, ¼-in.-port air-control valves are based on a single-valve body to which a choice of accessory parts may be added to attain any of five types of operation. The valves are of balanced-piston construction and embody no valve seats or rod packings to become worn out. Piston cups automatically wipe the liner clean.

Logansport Machine Co., Logansport, Ind. FYI 69

Shop "Carry-Tool" Is Made of Heavy-Gage Steel

Ball-bearing rollers on the drawers of the "Carry-Tool" are said to provide easy opening or closing either loaded or empty. This easy-rolling unit is made of heavy-gage steel and is provided with padlock attachments to protect contents.

Standard Pressed Steel Co., Jenkintown, Pa. FYI 70

PRODUCTION CURVES ARE RISING...

...at AMERICAN'S New Plant at WILLIMANTIC

Like a giant new ship on its "shakedown cruise"...when the officers and crew learn their new duties . . . and the machinery begins to synchronize . . . *then things really begin to move!*

And that's the situation, now, at American's new plant in Willimantic, Connecticut. Acres of the newest and fastest automatic machines are steadily boosting the production curves of both American Phillips and Slotted Fasteners . . . and the quality curve, as well.

This modern, streamlined plant will soon be one of the top-production units of the screw industry . . . deliveries expedited by national distribution which is now geared up to greater efficiency than ever before.

4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

Phillips

Willimantic production and shipments will be supplemented by our Norristown, Pennsylvania, plant and Chicago, Illinois, warehouse.

AMERICAN SCREW COMPANY

Plants at Willimantic, Conn. & Norristown, Pa.

Warehouses at:

589 E. Illinois St. Chicago 11

302 Stephenson Bldg. Detroit 2

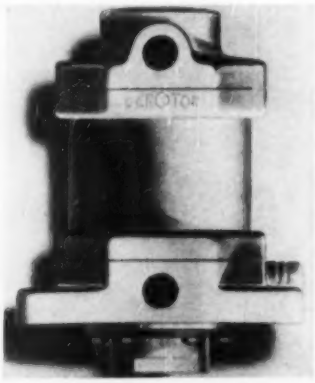
AMERICAN SCREWS

Slotted

Dial Depth Gage Measures Holes, Slots, Recesses to 3 In.

The flat base of the No. 644 dial depth gage is positioned on the top surface of the work to be measured, allowing the rod to enter the hole or recess to its full depth. The measurement automatically registers on the dial in 0.001 in. Base is 2½ in. long by ⅛ in. wide, hardened, ground, and lapped within close limits. The dial indicator, attached to the base by a flush hollow setscrew, is readily removable by a wrench furnished with the gage, and is interchangeable with any other standard A.G.D. indicator.

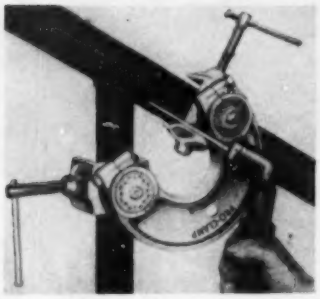
L. S. Starrett Co., Athol, Mass. FYI 71



Jumbo-Size Piston Rod Built Into Hydraulic Cylinder

Piston rods in the Geroter 2:1 cylinder are twice in diameter to that of standard rod size. Additional area of the piston rod reduces oil displacement within the cylinder, permitting the rod to retract at twice the speed that it extends. This, in turn, is said to result in the accomplishment of more work. Rod-end-flange, foot, trunnion, centerline, blind-end-flange, and clevis mountings can be obtained for these cylinders. They are made in 10 bore diameters in any stroke length up to 96 in. and with cushioning at either or both ends of the pitson rod.

Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass. FYI 72

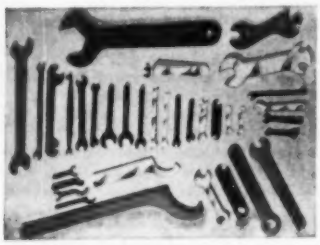


Jaw Capacity Increased to 2½ In. On Universal Welder's Clamps

One face of each of the two rotating clamps of the Model B Pro-Clamp has a flat surface for gripping plates or other flat work, and the opposite face is V-formed for handling round or oval pieces. Jaw capacity has been increased to 2½ in. Pressure screws may be shifted from one side of the clamps to the other so that either V or flat side may be placed next to the piece being handled.

Clamps rotate in a U-frame through a full 360°. Each clamp has a double 180° machine-cut protractor and a positive locking device so that desired angle can be set and held.

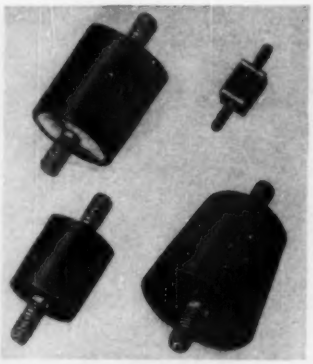
Bernard Welding Equipment Co., 741 E. 71st St., Chicago 19, Ill. FYI 73



Federal Tool Stamps Wide Range of Special Wrenches

Open-end, box, spanner, and special types of wrenches up to ⅛ in. thick, for special applications, are made to purchaser's specifications. Wrenches may be heat-treated, case hardened, or cyanided as required.

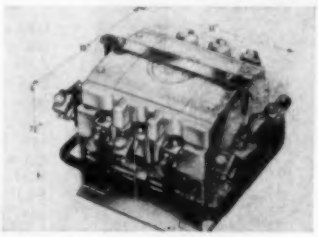
Federal Tool Mfg. Co., Dept. AM, 3600 Alabama Ave., Minneapolis 16, Minn. FYI 74



Vibration Isolators Installed In Compression or Shear

Finneflex stud-type vibration isolators are said to effectively control transmitted vibrations when installed either in compression or shear. Each mount is designed on a "floating rubber" principle. A rubber cylinder is rigidly bonded to steel end plates to which studs are welded. One stud is then bolted to a foundation, and the other to the piece of equipment. Isolators are available in 44 different sizes for load ranges from 1 to 270 lb.

Finn & Co., 2850 Eighth Ave., New York 30, N. Y. FYI 75



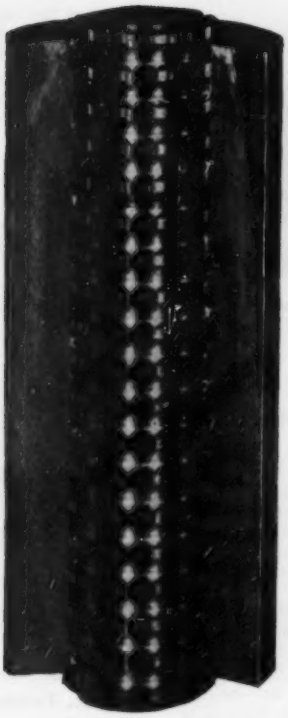
Small Magnetic Starter Provides Increased Contact Pressure

Size 4 "RA" magnetic starter is said to be the smallest size 4 unit offered. Compactness of the unit is achieved by a patented right-angle balanced mechanism, which employs full magnet power without lifting extra weght. A knee-action bellcrank fulcrum multiplies leverage and transfers it from a vertical to a horizontal plane. Contact pressure is claimed to be increased, while wattage consumption is reduced.

The arc is guided across and between quenching and baffle plates for maximum suppression. High heat-proof silicon chutes enclose each contact.

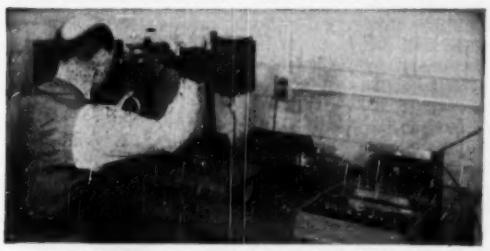
The Arrow-Hart & Hegeman Electric Co., Hartford 6, Conn. FYI 76

What makes a broach GOOD?



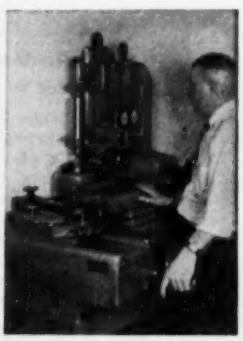
Typical of Colonial's continuous research on chip characteristics and the effect of various factors such as material, pitch, breaker spacing, etc., is this study on "deep hole" spline broaching.

At right, index and spacing checker for spline or serration broaches. Also checks lead. In front, special surface plate to check alignment. Note comparator in background for checking complex contours on broached samples.



Metallographic analysis of heat-treated specimens (taken at different radii on large broaches), precedes fabrication.

A complete chemical and physical lab provides facilities for metal analysis. Operated by trained technicians.



Test pieces produced during the grinding of involute splines on broaches are checked on this Michigan Tool involute checker.

A **GOOD** broach is about the most inexpensive tool you can buy—based on the number of finished pieces which it will produce. On the same basis, a poor or mediocre broach can be a costly investment, no matter what you pay for it.

Colonial's ability to consistently design and produce **GOOD** broaches is no accident. It is a matter of constant vigilance—checking and re-checking at every stage—plus the finest of inspection "tools". Here are some of the facilities that make Colonial broaches **GOOD** broaches.

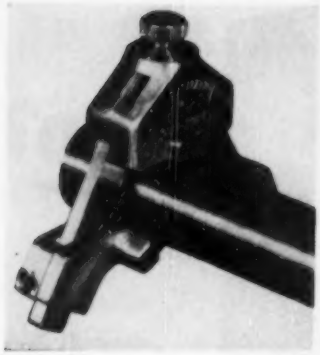
For the name of Colonial's representative in your area, write (Box 37, Harper Sta.), wire, or phone (LA. 7-1600) today.

PIONEERS OF H.S.S. BROACHING

COLONIAL

BROACH CO. DETROIT 13

Colonial Makes **GOOD** *Broaches*

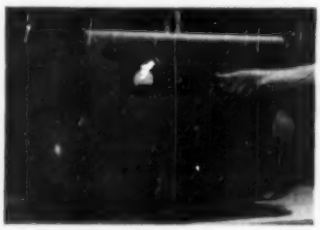


Honing Tool Finishes External Cylindrical Surfaces

No special machine or skill is required to produce accurate, highly finished, surfaces on cylindrical parts ranging from ½- to 2½-in. dia. with the Odee honing tool. It may be used with any lathe, drillpress, or electric drill, handling any length work or any material.

Diameter size is easily held to 0.0001 in. or less, by means of a calibrated feed dial which gives absolute control of the in-feed of the abrasive. There are no springs, screws, or hinges on the Odee hone to wear out. Stock-removal capabilities of this tool are in some cases comparable to those of a grinding operation.

The Micromatic Hone Corp., 8100 Schoolcraft Ave., Detroit 4, Mich. FYI 77



Single-Circuit Unit Charges Industrial-Truck Batteries

Single-circuit battery-charging equipment, for electrical industrial trucks, is fully automatic and has more than 2000 available adjustments of charging characteristics. Produced in two models the new charger is adaptable and includes all components for both lead-acid and nickel-iron-alkaline batteries.

Automatic operation includes battery cutoff and charger shutdown when battery is fully charged, as well as automatic disconnection of the charger from the powerline and opening of the charging circuit in case of power interruption. Automatic restart of the charger, upon resumption of service following an interruption, is also included.

Both models operate on 220-440v, 3 phase, 60-c power supply. They weigh 330 and 390 lb.

General Electric Co., 1 River Road, Schenectady 5, N. Y. FYI 78

Air-Operated Tool Crimps Solderless Terminals to Wire

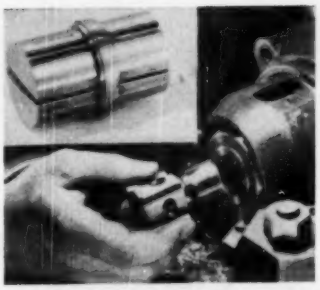
The advantage of a power press are combined with the flexibility of a handtool in an air-operated unit for crimping solderless terminals to wire. Heads are detachable to facilitate either conventional side or "stub"-position crimping. Suspension loop attached to the top of the tool is for support from above. Operating from standard shop outlets of 85 psi, this tool handles an AWG wire range of No. 22 to No. 1/O.

Aircraft Marine Products Inc., 1577 N. 4th St., Harrisburg, Pa. FYI 79

Portable Air Purifier Provides Six Outlets

Light enough to be classed as portable, the Bullard 6-outlet air purifier has 10 to 35-cfm capacity at 100-psi max working presure. The standard ¼-in. tap threads permit attachment of any airline fitting to operate all makes of spray guns or air tools, or any protective airline hood or helmet for operator protection. From one to six hoses may be attached. Working pressure is preset and controlled by a pop-off valve installed ahead of the manifold receiver. Combined chemical and mechanical air filtering is provided by the filter cartridge.

E. D. Bullard Co., 275 Eighth St., San Francisco 3, Calif. FYI 80

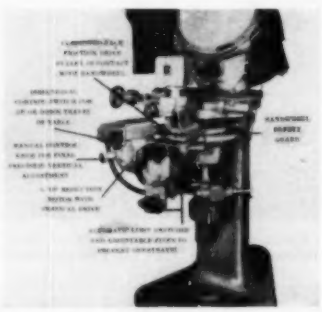


Expanding-Arbor Production Tool Holds Work by Inside Diameter

Auto-Arb is a production tool designed for holding work by the inside diameter while machining, counterboring, chamfering, or finishing the outside. It permits chucking and unchucking the work without stopping the spindle, requiring no tools for this operation. It works equally well in blind holes and eliminates need for especially built arbors for difficult jobs.

The Type V series will accommodate work with inside diameters from 33/64 to 1 in. on a machine with ¼-in. collet and from [illegible] to 1½ in. with a 1-in. collet.

The Asco Corp., 17718 Waterloo Road, Cleveland 19, Ohio. FYI 81



Power-Elevating Attachment Added to Optical Comparators

A single lever on this motor-drive unit for raising or lowering the work table of J&L Pedestal Type Comparators gives the operator control of rapid-acting vertical traverse. A guard keeps the operator's hands away from the handwheel, and electrical limit switches automatically cut off power at the extreme up or down positions, guarding against overtravel. Extremely delicate final adjustments are made by turning a narrow knob, mounted on the motorshaft below the control lever.

Jones & Lamson Machine Co., Springfield, Vt. FYI 82

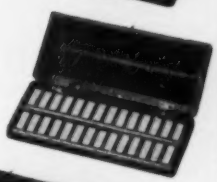
Ellstrom

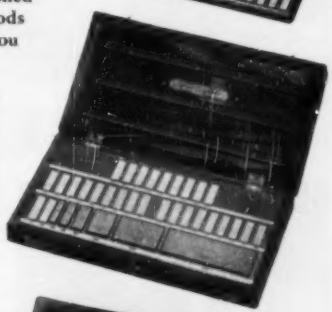
chromium plated gage blocks wear 5 to 20 times longer!

round

square

rectangular





How'd you like to make a big dent in your gage block costs? It's simple. Just specify "chromium" . . . Ellstrom chromium plated gage blocks. They're rated "tops" for all-around gage block quality . . . wear from 5 to 20 times longer than ordinary blocks, yet cost but very little more. Made of the finest materials . . . processed under precisely controlled conditions . . . and finally finished with their extra hard gaging surfaces through methods first developed and perfected by Ellstrom to give you longer wearing millionths.

Ellstrom chromium plated gage blocks are available in 12 standard sets . . . rectangular, square, or round . . . in working, inspection, or laboratory accuracies to meet every gage block requirement. Special sets, metric sets, or individual blocks are also available upon request. And every block in every Ellstrom set carries a positive guarantee of specified millionths to give you the accuracy and uniformity you need.

Ellstrom . . . *measuring in millionths for three generations.*

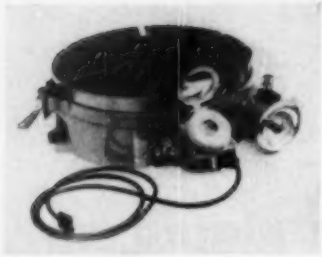
Do You Have the New Ellstrom Catalog? Contains complete specifications and prices on standard Ellstrom Sets . . . plus the new Ellstrom "Build-up" set, Internal Setting Gage, Inspection Service, and Trade-in Allowances. Send for your copy today!

For longer wearing millionths, specify **"Chromium"** . . . **Ellstrom** chromium plated gage blocks!

DEARBORN GAGE COMPANY

22035 BEECH STREET • DEARBORN, MICHIGAN

Originators of Chromium Plated Gage Blocks



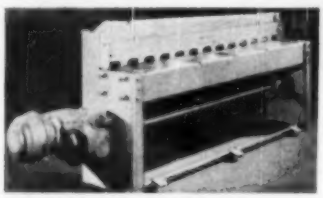
Rotary Index Table Set By Built-In Optical Control

OPL 16-in.-dia rotary index table is designed to provide extra capacity and rigidity necessary to machine the heavier run of jobs encountered in present-day toolrooms. It is intended for large-size milling machines, jig borers and grinders.

Model 16 is a high-precision indexing device, set by means of a built-in optical control. This control enables angular settings in degrees, minutes and seconds to be made from a master graduated reference drum enclosed in the table and mounted on the rotating platen. Spindle runout is held to within 0.0002 in. and the maximum error of indexing does not exceed 0.0005 in., measured at the periphery of the 16-in. platen.

Overall height of table 5¾ in. and weight is 175 lb. A clutch is provided for the platen drive and T-slots are provided for work mounting. All mechanism is sealed from dirt and oil.

The F. T. Griswold Mfg. Co., 305 W. Lancaster Ave., Wayne, Pa. FYI 83

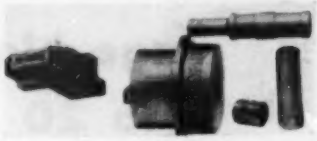


Power Squaring Shears Employ Four Cutting-Edge Knives

Downtime lost while waiting for dull knives to be reground is cut to a minimum on the Series 1 shears by use of four cutting-edge knives instead of the customery one. Shears can be obtained in 6-, 5-, 4-, and 3-ft cutting lengths capable of cutting 14-gage sheet metal at 85 cuts per min.

Convenient gaging is assured by front gages, side squaring gages, self-measuring back gages which can be indexed on intervals of 1/128-in. increments, and by precision ball bearings. An electric foot switch can be furnished for remote control of the shears. All mechanisms including clutch, gearing, flywheel, and detent of the completely inclosed transmission operate continuously in a bath of oil, and the drive and main shaft operate on anti-friction bearings.

Niagara Machine & Tool Works, 637-697 Northland, Buffalo 11, N.Y. FYI 84



Improved Wearing Qualities Finished Into Parker Dies

Hyper-honed finish is said to give Parker dies improved wearing qualities, rust resistance, less "down time," and more economical marking. All Parker hand and press marking dies, roller dies, embossing and coining dies, engraved hobs, steel type and marking segments, and graduating dies are now Hyper-honed.

The Parker Stamp Works, Hartford, Conn. FYI 85

Dump Trailer Has 2-Cu Yd Self-Dumping Hopper

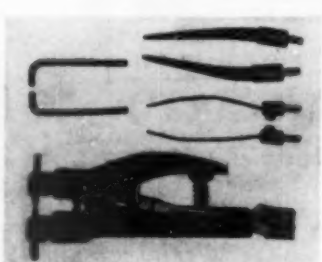
A safety lock on the Model DP-3B dump trailer provides positive locking and prevents accidental dumping of loads. Made from heavy steel, the trailer has a delicately balanced hopper which automatically dumps when the safety lock is released. After dumping, the safety lock automatically locks the hopper in place when it returns to loading position.

A jack stand affords accurate leveling and structural reinforcements and rolled edges prevent injury to personnel and tearing of load. Dual pneumatic tires are mounted entirely underneath the frame to provide minimum width.

Phillips Mine & Mill Supply Co., 2322 Jane St., Pittsburgh 5, Pa. FYI 86

Tweezer Welders Employ Condenser Power Units

Condenser power units eliminate line-current demand surges



Plier-type Tweezer Weld action is for heavier applications

Operation of condenser-type tweezer welders is said to be uniformly reliable. Welds are technically perfect and rejects are minimized. In bench models, speed of operation is limited only by rapidity with which operator can handle the parts, and with automatics 3600 parts per hr can be obtained with as many welded components as desired.

In the Tweezer Weld power units, 110-v lighting-circuit current or 250-v current is fed to condensers through vacuum tubes and transformers. Upon demand this stored energy is discharged through a transformer generating a welding current of large magnitude at low voltage. The cycle of charge and discharge is extremely rapid. Line-current-demand surges are eliminated, and the only movable part is one mercury relay. Current consumption is approximately equal to that of a 60-to 150-watt incandescent lamp.

Standard units come in 100, 200, and 250 mfd. Any value up to 600 mfd can be made to order. Electrodes can be supplied in the form of tweezers, pencils, or pliers.

Federal Tool Engineering, Inc., 533 Mulberry St., Newark 5, N. J. FYI 87

Maintenance Men Choose SKIL Drills for extra power on tight-spot repairs!

SKIL PORTABLE TOOLS

Setting up a new machine, running a pipe or power line, general repairs—they're all in a day's work for your maintenance crews. And 9 times out of 10, on any job, maintenance men prefer Model 80 SKIL Drill. Its practical streamlining makes it ideal for close-quarter work. Its extra power finishes tough drilling jobs faster, without stalling. Economical weight and perfect balance provide easy handling and control. Completely adaptable, Model 80 SKIL Drill is equally useful for drilling in metal, boring in wood and hole sawing. See your SKIL Distributor for a convincing demonstration, today!

MODEL 80 SKIL DRILL

is the most imitated ½" drill on the market. Its handles provide complete control, greatest convenience in tight spots. ½" capacity in steel, 1¼" in wood. All ball bearing construction.

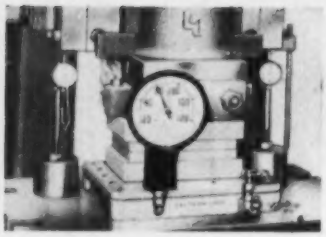
SKIL Products are made only by

SKILSAW, INC.

5033 Elston Avenue, Chicago 30, Illinois

Factory Branches in Principal Cities

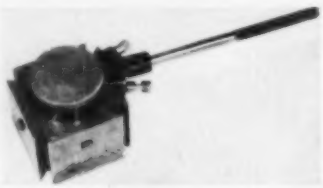
In Canada: SKILTOOLS, LTD., 66 Portland St., Toronto, Ont.



Punch Press Tester Measures Pressure Exerted by Ram

The L & J punch press tester is a hydraulic device with a recording gage that is placed on the press bed to measure the pressure in tons exerted by the ram either directly or through a die. Dial indicators located at both sides of the bed and contacting the gibways measure any frame deflection. This permits accurate determination of any frame deflection at any ram pressure.

L & J Press Corp., Elkart, Ind. FYI 88



Toolpost, Toolholder Combined in One Unit

Said to be rigid, accurate, automatic, and simple to operate, this combination toolpost and toolholder can be set at any desired angle by means of the upper locking pin on the base of the handle. It is made fast by the lower locking pin. A regulating bolt insures that the cutting edge of the tool being used is always on bed center.

Marnat Machine Works, 565—7th St., San Francisco 3, Calif. FYI 89

Offset Socket Wrench Handles "Around-the-Corner" Jobs

A universal joint incorporated in the handle of a socket wrench provides for offset screwdriver and wrench work. The handle can operate in any position up to 85° and provides continuous forward or backward rotation without removing the wrench from the screw. The handle slides over the shank for easy operation on non-offset jobs. The wrench shown is 1 in. wide, less than ¾ in. thick and 11 in. over-all. Both smaller and larger wrenches are made.

Vincent Peluse, 6 Mt. Carmel Pl., Poughkeepsie, N. Y. FYI 90

Neoprene Seals Protect Snap-Acting Precision Switch

A neoprene boot and neoprene side gasket seal the metal case of the Unimax type KMXB snap-acting precision switch, protecting it from moisture, dust, and splashing oil and water. The boot is sealed to the actuating plunger and the entire assembly is integral with the metal case. The neoprene seal retains its flexibility at all temperatures from –65 to +160 F.

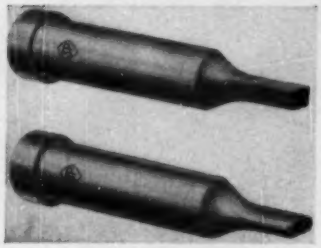
Unimax Switch Div., The W. L. Maxson Corp., 461 W. 34th St., New York 1, N. Y. FYI 91

Air, Hydraulic Cylinder Valve Made From Solid-Brass Bar Stock

Corrosion-resistant cylinder valve operates at pressures up to 1500 psi for air, oil, or water service. Proved, self-adjusting, packings eliminate the possibility of damage due to improper hand adjustment, minimize leakage, and assure long life.

Standard Model C-1000 cylinders are drilled and counterbored for mounting either on the piston-rod end or for the usual mounting on the side or foot. Standard double-acting and single-acting with internal springs or other special types are available to specifications.

Airmatic Valve Inc., 1643 E. 40th St., Cleveland, Ohio. FYI 92



Porter Button-head Punches Made in Square, Oblong Shapes

Button-head interchangeable precision piercing punches in standardized square and oblong shapes are manufactured from water-hardened tool steel. They are available in semi-finished condition, and are ground and finished to customer's specifications for immediate delivery. The series can also be supplied in high-alloy steels.

Porter Precision Products, P. O. Box No. 99, Cincinnati 31, Ohio. FYI 93

Silicone-Insulated Welder Has 30- to 250-Amp Current Range

A high margin of safety and operating dependability is said to be provided by the 6WK2OH silicone-insulated welder, since it is unaffected by high temperatures and is water repellent. It is 12x17 in. in cross section and 23 in. high. The unit weighs 154 lb and has a current range of from 30 to 250 amp and accommodates electrodes from 1/16- to 3/16-in. dia.

Instant arc striking without any manual adjustment is provided by "hot start" automatic control. The correct amount of boost is always furnished for any specific current setting.

General Electric Co., 1 River Road, Schenectady, N. Y. FYI 94

. . . at WESTERN ELECTRIC
Telephone Exchange Parts Precision Broached on Oilgear Machines

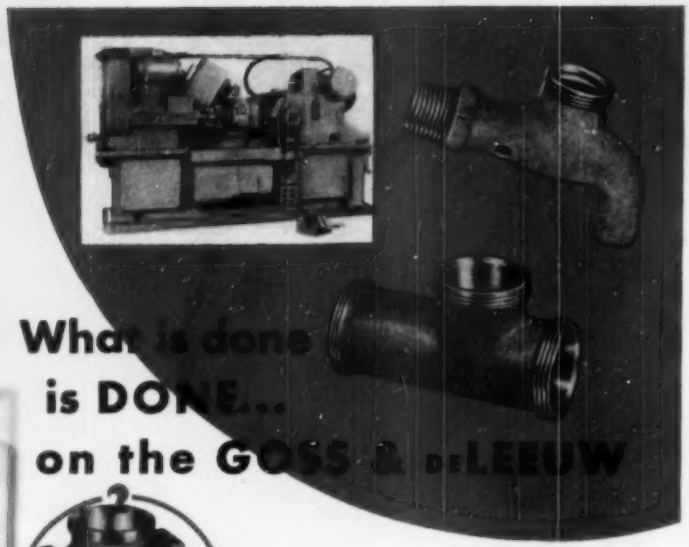
■ Oilgear Broaching Machines have been used by the Western Electric Company plants for many years . . . in some cases as far back as 1928. This great telephone and communications equipment manufacturer uses Oilgear Horizontal and Vertical Broaching Machines for finishing many delicate precision parts that go into telephone exchange assemblies.

In the scene above, three Oilgear single slide vertical surface broaching machines are used to finish various types of magnetic core pins. The first two machines finish broach two flats and a groove on 4 pins per cycle. Production on each machine is in excess of 1600 pieces per hour. The third machine broaches on each pass four 23/32" flats which have been butt-welded to round pole pieces. Production is better than 400 pieces per hour.

Oilgear Broaching Machines have many features which are available only on Oilgear Machines *at no extra cost*. Here are some of these features. Oilgear two-way reverse flow variable delivery pumps have an efficiency of 90% at full load. You get higher, independently adjustable, cutting and return speeds, and positive broaching speed up to 150% overload. The patented electro-hydraulic control is integral with the pump and eliminates valves and piping. Power is *saved* because power is *used* only in proportion to the load . . . because power is reclaimed on return stroke . . . because there are no valves to waste power. The Oilgear system is a simple system. It uses less piping, is accessible yet compact. Wider slides and tables on Oilgear Machines allow broaching of 2 or more parts per cycle. Oilgear also has longer tool slides, and longer ways. Pre-loaded work tables offer closer broaching tolerances and smooth, harmonic operation. For further information, write: THE OILGEAR COMPANY, 1563 W. Pierce St., Milwaukee 4, Wisconsin.

Oilgear PIONEERS IN FLUID POWER

BROACHING MACHINES AND PRESSES



AUTOMATIC CHUCKING MACHINE

There are no half-finished pieces lying around at the end of the day when you put your work on this outstanding machine.

The "1-2-3" feature—available only on the Goss & De Leeuw Automatic Chucker —provides the means of finish machining three ends of a part without changing set-up.

Note some of the typical parts machined. Ask for illustrated literature giving further details and send samples of your work for a cost estimate on handling it on the Goss & De Leeuw.

GOSS & DeLEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

ROUND TABLE Discussion

ALTERNATE DELEGATE

"I SEE where Al got sore because they put Henderson on that engineering lay-on job that the old man has concocted to put the pine needles in everybody's pants."

"What's he got to be sore about, Bill?" replied the workmate as he stuffed his mouth with food. "What's the matter with the job he has now?"

"Yes, I know, but it's the principle of the thing that's irking Al."

"Principle, my eye; I think the old boy's got ants in his pants and likes to beef."

"No, Tom, I don't think it's that," Bill comes back after taking a swig from his thermos bottle. "Al feels that he should have been given the chance to show his stuff."

Tom pulled out his pipe and filled it up. "I can't blame him in a way for feeling the way he does, Bill, but there is the firm's interest to be taken into consideration—you know what it'll cost in breaking in a new man for the job—gi'me a match."

"The firm's interest, humph!" came back the other as he sucked away at his stinking boiler. What about Al's interest? Doesn't it seem to you that he has a right to be given a chance at a job that has the prospects of advancement—the first thing you know Al'll be saying 'ta hell with it' and letting down on the job."

"That'll be his loss."

"Not only his, but the firm's. Al's done a good job in there with those milling machines—you know a good anchor gets stuck in the mud now and then."

Tom takes a cigarette and taps it on the back of his hand before lighting up. "Then it holds, doesn't it," he laughed. "That shows it's a good anchor."

"Listen, wise guy, I say it's bad psychology not to recognize a man's accomplishments," frowned Bill. "I get sore when I think of things like this. Here is a good man who has done a fine job and because he proved to be exceptional at it he has to take a back seat for some other guy who hasn't earned it. 'Tain't right."

"I agree with you about the reward stuff, Bill, but must a man be continually on the lookout for what's coming his way—that seems to be becoming the national pastime. Al's job was to pull the department out of a hole and he succeeded, so

LEAD ACCURACY

WITHIN .0001" PER INCH
IS NOT UNCOMMON...

IN
Hanson-Whitney
"FINISHED"
TAPS

The accompanying illustration shows perfect contact between the nut (internal) and the screw (external) threads... when lead, angle and diameters of both are correct.

Especially important in achieving this result is Lead Accuracy in the nut ... obtainable only when "Finished" taps have been used in tapping the nut.

Hanson-Whitney "Finished Taps" are finished after hardening... with thread lead accuracy within .0001" per inch, together with correct form and diameters, will give you tapped holes of greatest accuracy... so necessary for today's production and assembly operations.

Hanson-Whitney equipment for producing "Finished Taps" adequately covers the entire tap field. Diameters from 1/16" to 7½", and leads from 100 threads per inch to one thread in 7" can be produced. No better taps are made.

HANSON-WHITNEY COMPANY, HARTFORD 2, CONN., Division of the Whitney Chain Company

Valuable engineering, illustrated Catalog on request. Please use your business stationery.

Hanson Whitney
PIONEERS OF FINISHED TAPS

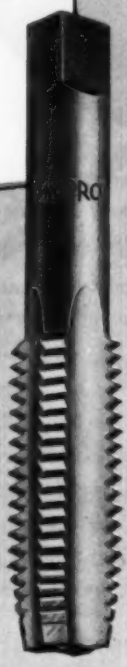
SHW80

Are you troubled with "THREADACHES" in your Tapping Operations?

Here's Your Prescription—

℞ For immediate relief—apply HY-PRO taps with correct speed, feed and lubrication. Continue treatment for complete cure. More accurately threaded holes will result, and your assembled parts can be fastened tighter, stronger to resist vibration

ORDER THRU YOUR DISTRIBUTOR



FOR CASES OF CHRONIC THREADACHES

Send detailed symptoms. Specialists in our Tap Clinic will make a thorough diagnosis, and recommend a treatment for an economical cure.

HY-PRO Taps last longer on the job, and wear longer between sharpenings to assure *Sustained Accuracy* — the true guide to tap efficiency and economy.

Send your name to receive the HY-PRO Stock List, mailed bi-monthly on request. Contains listing of standard and special taps in stock ready for immediate delivery.

HY-PRO TAPS

COMMERCIAL • PRECISION
SPECIAL
Ground Thread Taps

HY-PRO TOOL CO.
New Bedford, Mass., U.S.A., *A Subsidiary of Continental Screw Co.*

"Yeah, so what?"

"So, he should bask in the warmth of satisfaction that a job is well done."

"Oh, so you're another one of those guys who work for the love of working, eh?"

"You're darn tootin' I am. What's the use of money anyhow? Your old uncle'll get it eventually—no, Bill, I think Al should take it like a man and carry on; his turn will come in time."

"Sure it will; so will yours!" smiled the pipe-smoker. "After he gets his fill of lard oil and cutting compound —not to mention the thousand and one things that a foreman gets filled with—he'll get stuffed in a six-foot box and dropped into a hole somewhere."

"What do you expect? a seven-footer?" piped up Tom goodnaturedly. "By the way, Bill, the word you should have used is liaison—not lay-on."

"We're both wrong," laughed Bill boisterously; "its' lay in—just made it!" he concluded as the starting bell rang and he leaped down off the bench.

Jack Everett
San Francisco

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DRESS UP OR DRESS DOWN

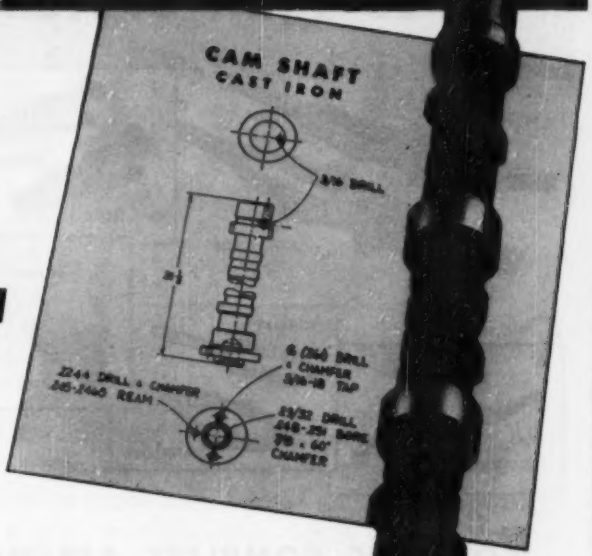
ANYTHING management can do to remove unrest because of lack of knowledge on the part of the employee the better the productive return.

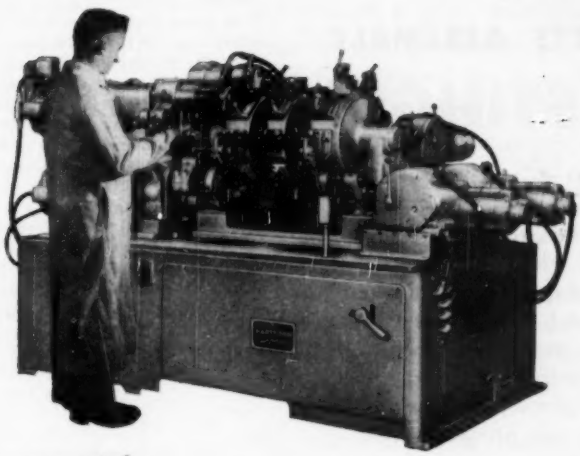
Naturally, the best way to combat this evil is by telling the worker, both what he wants to be informed of and some of the things he may not be aware he should know. There are two media open to all plants, a house organ and the bulletin board. The house organ is very good but has two definite limitations. One, it is an expensive undertaking if properly done and therefore is only for plants of fair size. Two, a regular publishing date which should be maintained, often does not coincide with the time for announcement of a policy decision or other important managerial statement, rather defeating one of its original purposes.

Now the bulletin board nicely overcomes both of these big points. Systematic control as to length of time notices remain, content, condition and size must be observed. The best way to achieve this is to place all bulletin boards throughout the plant under the supervision of one person—the personnel director or some individual in his department. As far as the matter of employees'

80 PCS. PER HOUR...

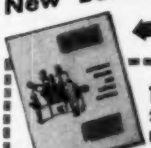
drilled, reamed tapped & bored on this Hartford Special Automatic Drilling & Tapping Machine





New Bulletin!

Send for free copy



The Hartford Special Machinery Co.
287 Homestead Ave.
Hartford 5, Connecticut

Please send me Bulletin DM-100 on your Automatic Drilling & Tapping Machines.

Name_____ Pos._____

Company _____

Street _____

City_____ Zone_____ State_____

HARTFORD *Special*

TRAILER HITCH MAKES 4-WAY SWITCH . .

NOW THE COMPLETE ASSEMBLY *uses* UNITCASTINGS!

Several months ago this hitch manufacturer switched one part of his assembly to Unitcastings after weldments proved unsatisfactory. Now he's changed over the entire unit. Unitcastings gave him lower end costs, pleasing eye appeal, greater strength with less weight, increased safety and no misfits. Sales have gone up several hundred percent—proving that Unitcastings not only give top performance but add to the saleability of your product. Build better and save with Unitcastings.

UNITCAST
QUALITY STEEL CASTINGS

Give us a chance to offer a "cast steel" answer for your parts problem. Our suggestions while your product is in the design stage will pay continuous dividends. Write or call today. Unitcast Corporation, Steel Casting Division, Toledo 9, Ohio. *In Canada:* Canadian-Unitcast Steel, Ltd., Sherbrooke, Quebec.

UNITCASTINGS ARE FOUNDRY ENGINEERED

notices are concerned they are filled with human interest and serve as a leavening to the industrial load.

The fear that these bulletin boards do not represent a good medium for the dissemination of news is rather unfounded. It is seldom one can put up a sheet or slip of paper that one or two persons aren't reading it before it's been firmly affixed to the board. Also it has been truly said that a man will read things in the plant he wouldn't bother to look at outside.

A clutter of overage announcements is the surest way to make people avoid looking. It is felt that regular attention to removal of bulletins the minute they have served their purpose is paramount. In addition, the change of color provides a sure-fire way of telling that "this" is new. One company reserves a panel into which are slid tastefully printed cards bearing a safety, pension or fringe benefit message. The wording is sparse and grouped to be read at a glance, so that painless propaganda absorption, however unconscious, is assured.

Safety and health posters are available in series or mailed monthly from group insurance companies and safety councils so that no firm should want for material to augment their own messages and employee's personal advertising. Cartoons clipped from magazines or better still those done by and about plant personnel supply a chuckle now and again that can well set the tone to a much to be desired lighter vein for the day ahead. All in all, then, "Dressed Up or Dressed Down" the plant notice or bulletin board can and should provide a real service for employer and employee if proper use and maintenance for the needs of both are kept in mind.

A. M. Elliott
Le Roy, N. Y.

•

ARE PROMISES MADE TO BE BROKEN?

WHEN a new man is taken on in a shop, there are risks on both sides of the transaction.

The new man takes a risk because he may be laid off at any time, and if he has a family, this is doubly true, whereas, in his former place, he may have felt that he was a permanent fixture.

In a new job, he does not know much about what he will meet up with. He may be pressed hard to keep up his part of the production; he may find his new foreman to be intolerable and they may clash; the

Because this message created such great interest, we're repeating it for you

May we EXPLODE an old theory on machining ?

Read what

ANTISEP A.P. BASE

is doing for others:

In 40 days a wheel manufacturer saved $341.60 on oil alone, with better tool life, no rust, no bearing wear, no parts too hot to handle.

•

Surface speeds up to 340 FPM were attained on an automatic machining large bearing races of 52100 steel. "Only oil having sufficient lubricating qualities," says the manufacturer.

•

Cost of machining air hose coupler reduced from 46¢ to less than 10¢ per gal. for Antisep solution. Work is cooler and cleaner.

•

A collet maker estimates Antisep Base on one automatic saved him $350 last year.

•

Tool life on forming tools has increased 100%, says a clamp maker. Production upped 15% since switching to Antisep Base.

We refer to the idea that no water-soluble oil should be used as the cutting fluid in automatic screw machines. A few years ago we might have agreed with that—but not now! There is one—and one only—which we would now recommend for automatics. That is ANTISEP All-Purpose Base. Solutions of that modern concentrate are being used all over industry in automatics, because it is proving more than satisfactory from every angle—cooling ability, safety, finish and speed.

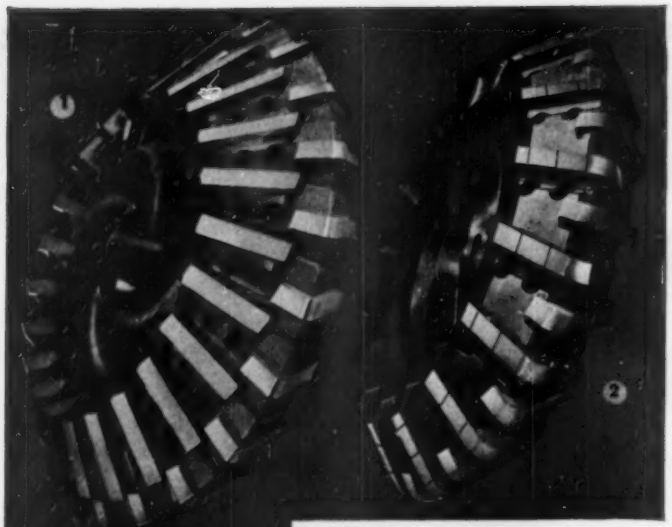
The reason is that Antisep A.P. Base isn't just another water-soluble cutting oil. It has established an entirely new concept in machining. Here is a base oil with high fatty content, anti-welding characteristics, high film strength and excellent lubricating qualities. It may be used for 90% of all machining jobs, and it costs, in solution, less than 7 cents a gallon!

May we cite you authentic instances of where and how Antisep Base is out-performing former types of cutting fluids in automatics? We believe you'll then agree that we've busted an old tradition wide open. E. F. Houghton & Co., 303 W. Lehigh Avenue, Phila. 33, Pa.

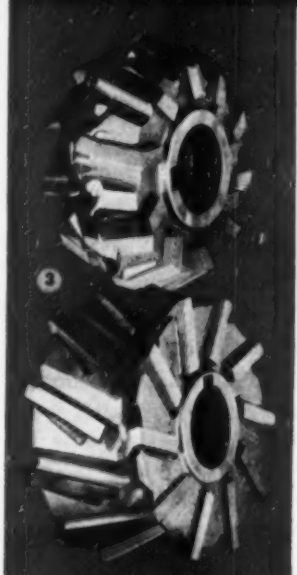
HOUGHTON

PRODUCTS FOR METAL WORKING

CUTTING OILS • QUENCHING OILS • HEAT TREATING SALTS • METAL CLEANERS
RUST PREVENTIVES • INHIBITORS • "FORTIFIED" LUBRICANTS • PACKINGS



Problem Milling

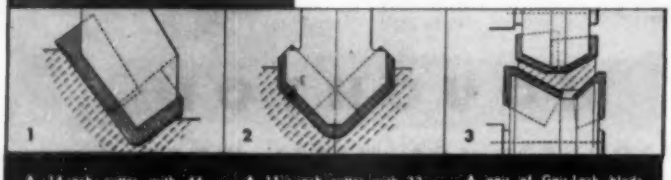


For heavy machining where there are severe shock loads on the blades, rigidity, long blade life and economy must be built into the cutter.

In these examples, bodies are of chrome vanadium steel, fitted with inserted blades, serrated in the direction of greatest wear, and locked in place for utmost rigidity, to provide for shock load, radial pressure, and thrust. Cutting clearances and chip egress are also worked out for each specific condition.

If you have a milling problem, put it up to us. Thousands of special Gairing cutters have lowered unit costs in scores of industries. Just call in your Gairing Representative, and he will start us figuring, at no obligation to you.

The Gairing Tool Co., Detroit 32, Mich.



1 A 14-inch cutter with 44 blades milling hook flange on drive housing

2 A 15½-inch cutter with 32 blades, milling toggle seat groove on crusher pitman

3 A pair of Gair-Lock blade cutters for rough milling of turbine blades

men he works with may "shag" him because he is a new man, but it is up to the foreman to see that this doesn't occur; he may find that his new job is too far from his home which will cause him to leave very early in the morning in order to get to the plant on time and other circumstances may be a great handicap to him. In such cases, a promise is no good.

A few years ago, in a plant near Buffalo, several men of their regular force were tried on a piece work job and it was found that one of their best men could produce a good day's work and a piece rate was set because of his efforts, but there was too much scrap.

On account of criticism he left unceremoniously, thereby breaking a promise to stay with the job.

An ad was placed in a city paper for a man to do piece work on an engine lathe. There were probably thirty men who appeared, each of them looking for the job.

Eight men were interviewed but none of them seemed to be satisfactory, but the ninth seemed to be just what the doctor ordered.

He was neatly dressed; he talked as if he had done much work and his credentials were excellent.

When asked when he could begin work, he replied that he was ready then and he had a suit case which contained his overalls and his lunch.

He was taken to the lathe and questioned. He said he had done work on a duplicate lathe in another shop.

He changed his raiment; his overalls were clean.

Then he asked, "Who grinds and sets these tools?"

When he was told that he was expected to grind his tools, he replied, "I don't sharpen my tools, but I'll show anybody how I want them ground and how I want them set."

The foreman was taken aback. He thought the man was all-fired good or else he was a phony.

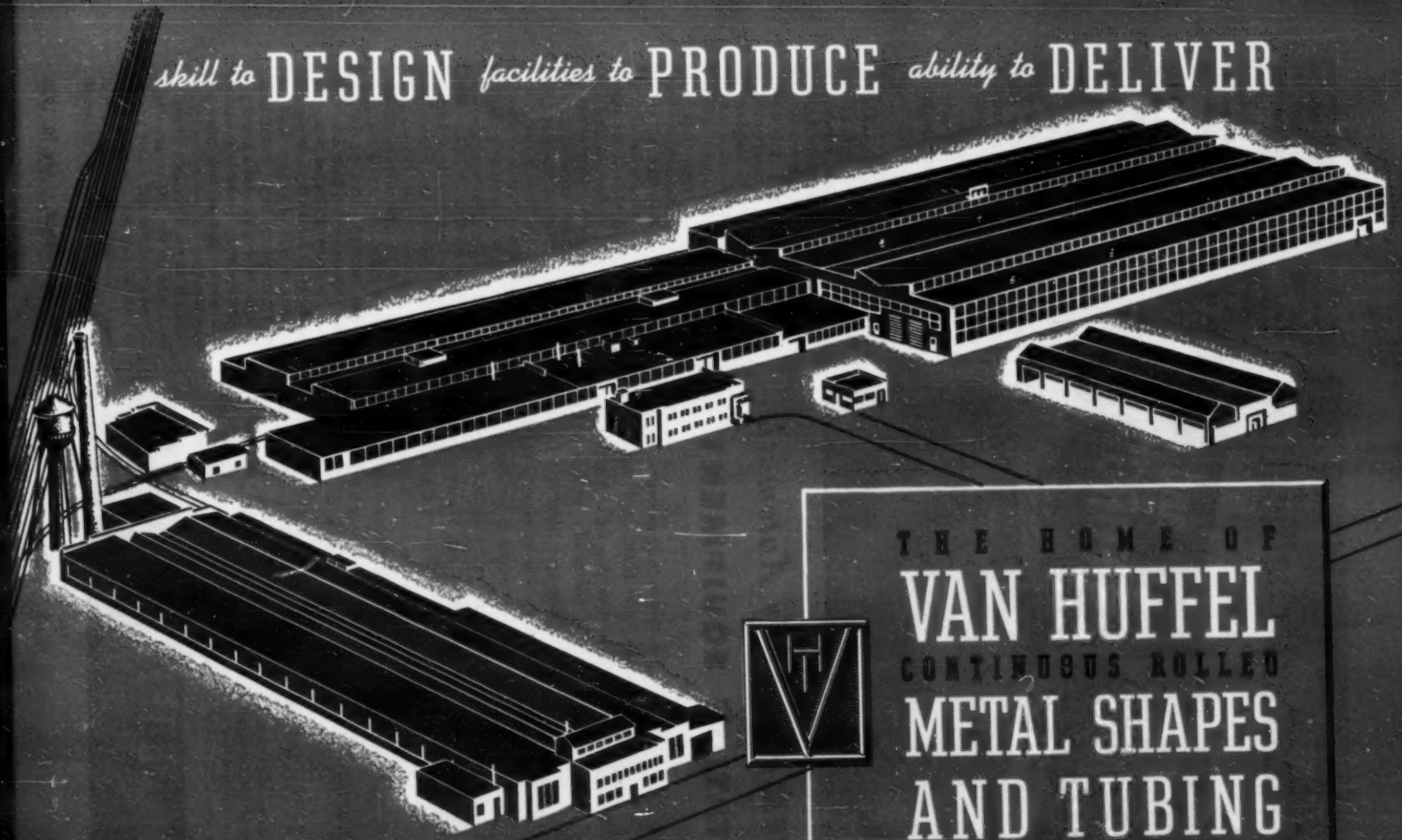
However, the foreman, to make sure, took him to the tool-making department and allowed him to give his own ideas as to the grinding and setting of the tools.

Then he wanted tote boxes placed to suit him.

He began to work, and to say that he "ate up" the raw material as it came to him, is putting it mildly, for he did nearly three times the work in a day that his predecessor had done. He was a thoroughgoing man and was appreciated by those who worked with him.

Now, note: As the work was to be finished in a few days, temporarily,

skill to DESIGN *facilities to* PRODUCE *ability to* DELIVER



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CONTINUOUS ROLLED

METAL SHAPES

AND TUBING

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HOFFMAN *Fully Automatic*
FLOTATION EQUIPMENT

Saves "Down Time"

Boosts Production

Lengthens Wheel Life

Pays for Itself

A marvel of truly automatic convenience, the Hoffman Flotation unit clarifies soluble oil and water coolants by means of a unique and exclusive principle. No filter aids to add or change—no screens to plug – no need for constant maintenance. Dirty coolant enters a tank and is aerated by a rotor-stator. Waste solids are held in suspension by froth and skimmed off automatically. Clean coolant, of exceptional clarity, is continuously spilled into a reservoir for return to machine tools.

GET FULL DETAILS AND A FREE SURVEY

For increased machine tool productivity—longer wheel life and reduced maintenance, investigate Hoffman Flotation Equipment. Standard sizes with flow from 20 to 1,000 gallons per minute. Larger sizes available. Write today.

FILTRATION DIVISION U.S. HOFFMAN MACHINERY CORPORATION
211 LAMSON STREET, SYRACUSE 6, N.Y.
CANADIAN PLANT: CANADIAN HOFFMAN MACHINERY CO., LTD., STEINMARKET, ONT.

he discussed the prospects with the foreman and, after their talk, he decided to leave and so gave the firm the proper notice. He had made no promises.

Now, how much nicer it was for him to do this in a decent manner for he left a good taste in the mouth of his department head.

Turning to the firm's side of the question, many of them will promise steady work to an applicant, but, should any event occur whereby the income of the firm is lessened, do they make up stock for the future? They do not. They lay off men whenever expenses are to be reduced.

Again, a firm may sell the making of certain products to another manufacturer and close the department where the products are made, so the men hold the bag again.

F. H. Stebbins
Worcester, N. Y.

•

A PROMISE to stay, extracted from a prospective employee during a hiring interview, is neither a valid nor fair demand and should not be used by an employer in any calculations he may make as to the permanence of the prospect's employment. The employer should base his decision on hiring the candidate on the applicant's past employment records. If the employment application form at the interview indicates the man is a drifter who goes from job to job, the employer is running a grave risk in hiring on the basis of the man's promise to stay on the new job.

Of course, even with the best of applicants, future dependability and loyalty are chances the employer takes when he hires a man; the worker is not obligated to stick if he does not want to. It may also be argued that a promise to stay extracted during a hiring interview is in the same category as a promise made by a foreman that the man will have a steady job. Neither can conscientiously promise fulfillment of such statements. There are other factors involved which do not permit a guaranty to be made. The foreman cannot tell when it may be necessary to lay off the new man on account of lack of orders. And the new man cannot in all truthfulness promise he won't accept a better job if circumstances make it available. The worker has to look after his own interests.

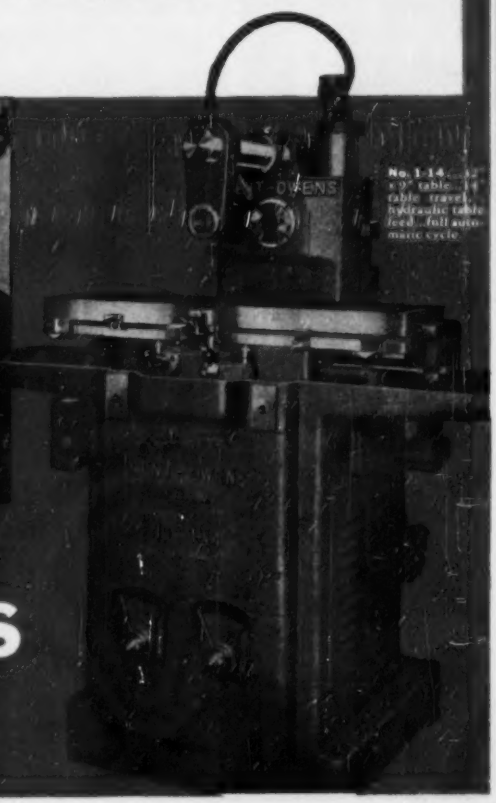
As far as the foreman's efforts to keep men on the job, an important foreman ability is still fitting people to jobs, so that the demands of the jobs in his department are matched by qualifications in the people placed

Breeze right through

TOUGH MILLING JOBS WITH KENT-OWENS MILLING MACHINES

Now is the time to "chart your course" to greater production and lower costs . . . with Kent-Owens Milling Machines!

Designed for *top-speed* and *accuracy* where the going is tough . . . ruggedly built . . . efficient . . . dependable. Especially, you'll like the many practical features of Kent-Owens Machines that save job-time and labor. Write for bulletins on the Kent-Owens Standard line . . . including wide range of hydraulic and hand operated machines. Also, let our engineers help you with special machine requirements. Kent-Owens Machine Co., Toledo, Ohio.



Call on

KENT-OWENS

for Milling Machines

CUSTOM MADE
at NO EXTRA CHARGE

Jarvis
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JARVIS POWER TOOLS
TAPPING ATTACHMENTS
TECNI-TAPS
ROTARY FILES
FLEXIBLE SHAFTS and
QUICK CHANGE CHUCKS and COLLETS

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

on them. Too many cases of square pegs in round holes have caused needless disruption of shop production and undue turnover. To put the right men in the right jobs and keep them on the job, the foreman must know first, the requirements of the jobs, and second, the qualifications of the applicants. Then he must match the two. To the extent that a foreman places the right man on the right job, he has laid the foundation of efficient operating and for satisfied workers.

If the applicant is to be accepted, he should be given as clear a picture as possible of the opportunities with the company. Tell him about the possibility of learning more important jobs and acquiring new working experiences, promotional opportunities, personal advantages, such as vacations with pay, meals at nominal cost in the cafeteria, group life insurance, etc. A common fault, particularly during times of labor shortages, is to oversell the applicant on the job and its possibilities. Building up the hopes of the person too high and failing to point out the unpleasant features of the job cause him to become easily discouraged and usually result in losing the employee. There is no substitute for an honest and straightforward statement of both advantages and disadvantages of the particular job or department.

The most obvious cost savings in a department lie in being certain that everyone in the department is working efficiently and to the best of their abilities. This can be accomplished only if the hiring of the employees effort is made to weed out the incompetents, malcontents and drifters by proper hiring procedure, including adequate interviews and tests.

After capable men are hired, good management knows that good employees stay on the job and are loyal when morale is maintained through the honesty, fairness and cooperativeness of the employer. As one skilled mechanic told me recently: "My interest is in the future of the company I work for because it is a good place to work and I hope to spend the rest of my working days there."

"A company is known by the men it keeps."

Harry Kaufman
Philadelphia

•

A FOREMAN or employment manager who tries to get a promise from a new employee that he'll stay until his dying day is always overstepping

"With Gulf Soluble Cutting Oil we eliminated rusting of work in process,"

"With the soluble oil we used previously, steel parts rusted between machining operations," says the Assistant Superintendent of the machine shop. "Now we use Gulf Soluble Cutting Oil—1 to 20 mix—and this problem has been eliminated. Finished surfaces stay bright. This speaks well for Gulf Soluble Cutting Oil since some of the parts must be protected for as long as two weeks."

Other properties which make Gulf Soluble Cutting Oil the preferred cutting fluid in scores of machine shops: It emulsifies readily with all but the hardest water; forms a stable emulsion; and is nonfoaming.

Gulf Oil Corporation · Gulf Refining Company

GULF BUILDING, PITTSBURGH, PA.

Sales Offices - Warehouses

Located in principal cities and towns throughout Gulf's marketing territory

For further information on Gulf Soluble Cutting Oil—and for one of Gulf's practical slide-rule-type calculators which will help you maintain desired soluble oil concentrations—send the coupon below.

Gulf Oil Corporation · Gulf Refining Company AM
Pittsburgh 30, Pa.
Please send me, without obligation, the material I have indicated below:

- ☐ Further information on the new Gulf Soluble Cutting Oil.
- ☐ Practical Slide-rule-type calculator for help in maintaining desired soluble oil concentrations.

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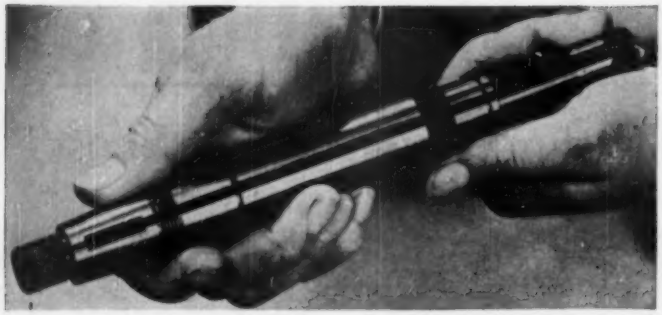


New Rycut Alloy Steel Cuts M* Costs 40%

**M stands for all machining and related costs including actual machining time, down-time necessary to re-grind tools and finishing time.*

Here's how:

1. Rycut, a medium carbon alloy, machines 25% to 50% faster than standard alloys of the same type, in either the annealed or heat treated condition.
2. Rycut generally increases tool life 100%—in some cases, as much as 300%.
3. Rycut requires less grinding after hardening due to its better machined surface finish.

These savings have been proved by the shop experience of Rycut users throughout the country as well as by carefully recorded machinability tests. Yet the initial cost of Rycut is practically the same as that of standard medium carbon alloys.

You need no special shop techniques with Rycut. It requires only conventional oil-quench and temper methods of heat treatment; also responds well to flame or induction hardening. And remember, a Ryerson Certificate of analysis and hardenability accompanies every shipment of annealed Rycut to guide its heat treatment.

This money-saving steel is available for immediate delivery —annealed or heat treated—in rounds, flats or squares in a wide range of sizes. Just call your nearest Ryerson plant for test samples or an initial order of Rycut or for any other steel requirement.

Technical bulletin explaining the advantages of Rycut sent on request.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled & cold finished
STRUCTURALS — Channels, angles, beams, etc.
PLATES—Many types including Inland 4-Way Safety Plate
SHEETS—Hot & cold rolled, many types & coatings
TUBING—Seamless & welded, mechanical & boiler tubes
ALLOYS — Hot rolled, cold finished, heat treated
STAINLESS—Allegheny bars, plates, sheets, tubes, etc.
TOOL STEEL—Oil and water hardening
REINFORCING—Bars & Accessories, spirals, wire mesh
MACHINERY & TOOLS—For metal fabrication

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • DETROIT CINCINNATI • CLEVELAND • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS LOS ANGELES • SAN FRANCISCO

his bounds. Frequently it automatically sets up within the employee a feeling that maybe something is "offside" or "rotten in Denmark". Maybe he should continue to look around for a place where they are not having trouble holding men on the job. Funny how little things react with people.

Now, if you are losing men that you hire, you'd better sit down in your office and do some thinking. What is wrong with you or with your department that men don't want to continue working more than a couple of weeks? Let's just analyze a few things that might have their effect on a new employee:

1. How did you conduct the interview?
2. Were you highhanded and did you consider that you were doing the employee a big favor to hire him?
3. Did you set up any doubt in his mind about the working conditions?
4. How are your shop working conditions?
5. Do you have a place that an employee likes to work in or is it a disgrace to the company's housekeeping?
6. How much time do you spend with a new employee getting him acquainted with the many factors of his new job?
7. Do your older employees help to make a new employee feel welcome and at home?
8. How is your foremanship?
9. Is the company itself partly to blame for conditions existing that are beyond your control such as improper restrooms, poor wage scale, etc.?
10. How can you better sell yourself and the company to your new employee?

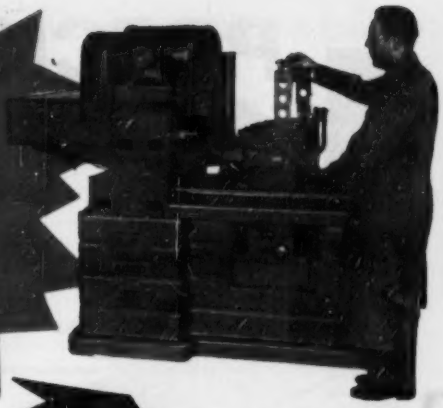
It is not always that the man is just a drifter but that working conditions and frame of mind play a great part in the holding of an employee on the job. Yes, and there are other things to be considered that effect the working relationship of a new employee.

How are living conditions? Is your housing situation adequate to take care of the new employees? Are there rents available in the proper price range? Is your town or city progressive? Are the stores modern? What are your school and library facilities?

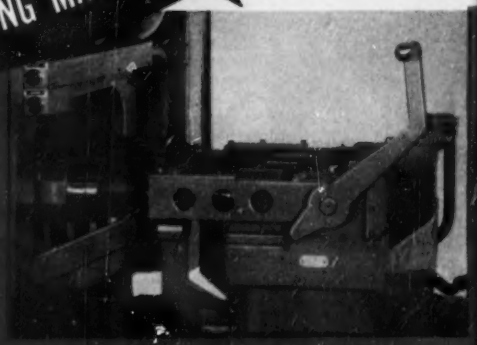
These things do affect a new employee and many times even have their effect on an older employee when they learn that the town or city only 75 miles distant has a better school, more modern stores and better civic activities. Better make it your duty to see that your

8 SURFACES MACHINED ...1046 PIECES ... PER HOUR ...

... ON EX-CELL-O PRECISION BORING MACHINE

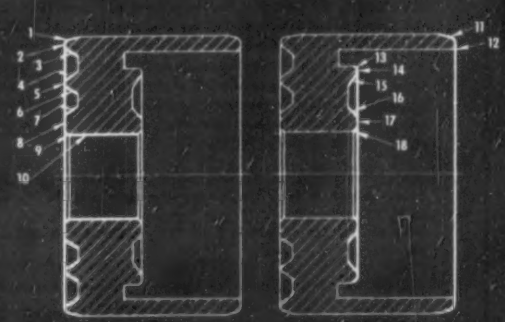


Operator placing pistons on loading pins. Movement of the loading lever controls the automatic machine cycle.



When the loading bracket has been turned down toward the spindles. Further movement of the loading lever swings parts to the chucks.

Three enlarged drawings show in heavy lines the surfaces finished on the nine Ex-Cell-O Precision Boring Machines. One machine finishes the surfaces numbered 1-10; the other 11-18.



Two Style 112-C Ex-Cell-O Precision Boring Machines finish eighteen surfaces of the parts shown in the drawings at right below. One machine finishes 8 surfaces at the net rate of 1046 pieces per hour; the companion machine finishes 10 surfaces at the net rate of 640 pieces per hour. The parts are automotive shock absorber pistons, approximately one inch in diameter.

The spindles, four on each machine, operate continuously. Work loading equipment and automatic ejection of finished parts contribute to the extremely fast machine cycles.

Whether your work involves precision machining in large volume or in small lots you'll find that it's economical to use *standard machines* whenever possible. Ask your Ex-Cell-O representative for complete information on standard Ex-Cell-O Precision Boring Machines.

XLO

EX-CELL-O for PRECISION

50-30

EX-CELL-O CORPORATION

DETROIT 32 MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • PAINT EQUIPMENT

PRECISION GEARS

(AN ARGUMENT)

Does any mechanism operate at top efficiency when its power is transmitted through inaccurate gears? Then why are you so liberal with the tolerance you allow in the forming of your gears? Wouldn't you rather have precision gears if you could secure them at the same cost?

HERE'S NEWS FOR YOU!

The Hamilton No. 1 Gear Hobber is a machine designed for the forming of small, super-accurate, spur, spiral, bevel, worm, and face gears. (By small gears we mean gears of six inch diameter or less). It is of extra rigid construction, for the maintenance of accuracy, and embodies the unique feature of independent speed, feed, and indexing selection. This last named feature greatly facilitates set-up. In fact, it reduces the time consumed to a point far below what is normally considered minimum.

Thus, as you will perceive, the Hamilton No. 1 Gear Hobber is a machine, the principle of which eliminates the possibility of indexing error; the rigidity of which maintains accuracy and encourages heavy production loads; the setting of which speeds production both by conserving set-up time and by allowing maximum cutting speeds on all materials; and the accuracy of which is reckoned to .0002". If more accurate gears would be advantageous to your operation, you should know more about the Hamilton No. 1 Gear Hobber.

We will be glad to supply engineering information about the application of the Hamilton No. 1 machine to your particular job. Communicate!

Also ask for our Bulletin H 1-49. It illustrates and explains the Hamilton No. 1 machine in detail.

DEALERSHIPS are still available in eight territories. Write for information.

THE Hamilton TOOL COMPANY

[illegible] NINTH STREET • HAMILTON • OHIO • U • S • A

company takes an active part in improving your town or city if you want to make your own job easier and be able to hold those men you hire.

Charles D. Townsend
Ft. Wayne, Ind.

•

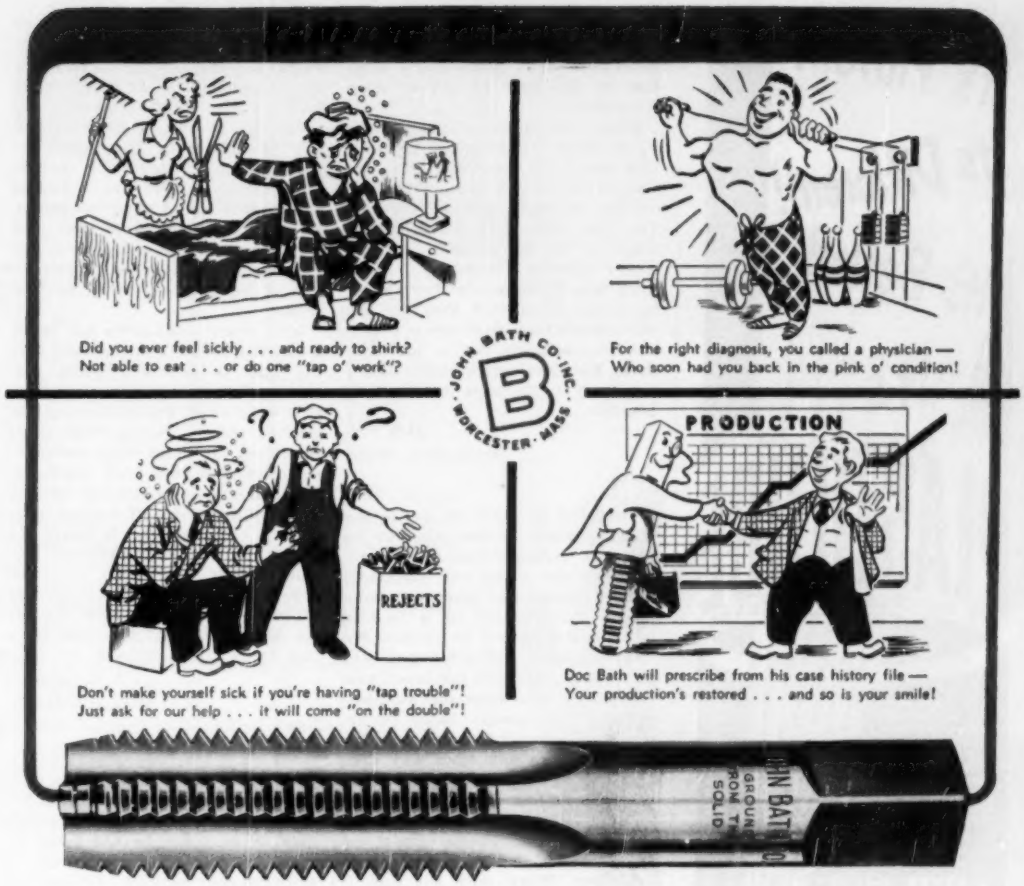
COST SHARK

THIS IDEA of figuring the cost of an article before it is completed is on the up-and-coming list. It is my thought on the matter that it is better to know approximately what a job will amount to before the machines are set up. Many a job is figured on a bid basis and usually goes to the one with the lowest price. If this price is set too low, the outcome is usually a loss for the firm doing the work. If all of the work were figured before its undertaking, it would give more experience in the figuring of costs on bid articles.

I don't see any reason why it should be taken for a check on the men or used as a tool to speed up operations. If this is the type of man you have on the job, why not use this as the means of finding him out. I like the type of man who will look at an estimated cost sheet and then try to figure ways and means to come out ahead of the time allotted. This to me has always been a means of bringing out the ideas the fellows might have somewhere in the back of their mind and just waiting for the opportunity to use. Most of the employees know that these cost sheets are cheked by the "brass hats' 'and are a valuable accounting of the accomplishments of the worker.

There are many things, "contingencies as the article puts them, that have to be considered. Trips to the wash room, set up time, and the usual bull sessions that accompany each new job into any shop, but with a system of figuring costs on a practical basis, all of these may be allowed for.

The foreman in this case seems wound up because it will be his job to estimate these sheets. Who is in a better position to know the men that will do the job and take into consideration their different working habits? Not only is he supposed to know his men, but also the possible production on the machines in his department. Many a cost sheet that is figured in the engineering section or by the boss as he reclines in his plush-lined chair comes out on the short end when the final time card is turned in. Why? Because they haven't taken


Did you ever feel sickly . . . and ready to shirk?
Not able to eat . . . or do one "tap o' work"?
For the right diagnosis, you called a physician —
Who soon had you back in the pink o' condition!
JOHN BATH CO. INC. WORCESTER MASS
REJECTS
PRODUCTION
Don't make yourself sick if you're having "tap trouble"!
Just ask for our help . . . it will come "on the double"!
Doc Bath will prescribe from his case history file —
Your production's restored . . . and so is your smile!

INSIST ON BATH TAPS . . . PROFIT BY THEIR PLUS-PERFORMANCE

Tapping difficulties are often simple – yet illusive! Problems range all the way from bellmouth holes, over or under size holes, tap breakage and chipping to more complex problems such as the proper drives for stud fits in various materials and pressure tight fits for steam, gas and acids.

Our engineers (who long ago perfected the "ground from the solid" Bath tap) have accumulated a wealth of reference data during many years of threading experience. Tell us about your tapping troubles . . . let us help you improve thread quality, increase tap wear-life and reduce tapping costs.

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED

22 Grafton St., Worcester, Mass.

It's Proven!
It's Different!
It's Better!
It's
PLASTILUBE
THE SUCCESSOR TO GREASE
In the past 90 days, over 600 cost-and-quality-conscious maintenance engineers have bought and now specify PLASTILUBE, the successor to grease. PLASTILUBE is compounded with Warren 1-45 and BENTONE, a product of National Lead Company.
Check these qualities of PLASTILUBE against the grease you are now using:
★ NEVER MELTS
★ LASTS LONGER
★ MULTI-PURPOSE
★ WATER RESISTANT
★ BETTER ADHESION
★ GREATER STABILITY
★ BETTER PUMPABILITY
★ COSTS LESS IN USE
You can benefit like hundreds of others—place your order today.
THE Warren REFINING & CHEMICAL COMPANY
CLEVELAND 13, OHIO
The Warren Refining & Chemical Company
DEPT. AM-3
CLEVELAND 13, OHIO
Rush my sample of PLASTILUBE
50

the foreman and his valuable know-how into consideration and probably have overlooked some small item that at the time looked an easy assignment.

Many times in figuring these sheets in my shop, I have taken the men that would do the work into conference on the task and gotten their opinion on their part of the job. This not only gives me a double check on my figures but also give a very valuable opportunity to know these men better and let them know by actual proof that they are the ones upon whose shoulders is placed the responsibility for a job well done. Men like responsibility and I try to give them as much as is possible.

Jack Bell
Bakersfield, Calif.

•

WE CANNOT let ourselves get in the position where we feel what we do today is sufficient for the future. Through the years our standards in both quality and production have placed this country in a leading position that cannot be denied. We must maintain that advantage and go forward with new machines, new equipment, new ideas and methods.

There are always those people who cry impossible when you try to do a job in any other way than that in use. That word impossible can only be found in the dictionary of fools. If we are to stay in business we must have some idea of the cost of each job before it goes into operation. When once the cost is determined it gives us something to work with.

A good way to control the cost of all jobs is to provide work cards which are signed by operator and are punched at the start and the finish of each job in each operation. Operator also rings up his card for any and all downtime or any and all delays. In this way we know how long it takes to do the job and it also gives an accurate study in costs. This system also tells us in what department the job is in any given day and how far advanced it is in the department. Every operator knows what task is expected of him to meet the standard set up for him on that size.

However, our responsibility does not end in simply laying or arranging the work the employee is supposed to do. If we expect a man to do a job we must make sure he knows all there is to know about the work laid out for him. It is then up to us leaders to help him with his ideas to do a better job or to attain a lower cost. All too often We tell the employee what we want. We do not mention one word about what he wants. The employee is not interested in what someone else wants. He is most of all concerned with his own needs. There are some things we all want which include good working conditions, a feeling of importance, and some recognition of ability. We can give a man good working conditions and a feeling of importance by an honest appreciation of some good quality he possesses.

It is every executive's job to be a cost shark. Every firm should take the time to get their parts, machinery and experimental work done at a time when things slow up for lack of orders. During these short recessions there are more manpower, machinery and tools available. There is also more time to experiment with the idea of cutting costs. That is also the time to spend the money for new more modern machinery that will in the long run save the firm money. A man may be satisfied with his car, his dog, or his fishing rod but he must be a cost shark at his business.

A. E. Salmons
Philadelphia, Pa.

•

CACHE OR CONFESS

THE ATTITUDE of a supervisor toward mistakes and spoilage either may or may not be the cause of a man hiding spoiled material in any isolated instance. Underlying this entire problem may be an unhealthy attitude on the part of the supervisor alone, on the part of the employee alone, or on the part of both. "Protecting a man's pride" may lead one into deep water, as well. There is a school of psychologists who tell us we should ever be alert to make the other man feel important, if we desire to win and hold his friendship. They are only partly correct.

Any human being must maintain a feeling of worth, in order to be really happy, but all men should be educated to realize that unless that feeling of worth is honestly obtained, it will still let them down. There are many men who are emotionally immature. These men find it most difficult to admit having made a mistake, whereas a man mature in mind instinctively knows that any supervisor who is worthy of holding the position he occupies is cognizant of the fact that all men make occasional mistakes.

A healthy approach to the prob-

Now - more value than ever...

WITH 5 NEW FEATURES TO HELP CUT YOUR COSTS

P&H Zip-Lift Available in Capacities up to 2000 lbs.

Good news for hoist users! The Zip-Lift now brings you even more Added Value features to improve your service and help you cut handling costs. And not a penny has been added to the price!

- **NEW** Magnetic Lower Limit Switch; cable cannot run out and rewind itself.
- **NEW** Extra Ground Conductor on feeder cable for greatest safety.
- **NEW** Reinforced Push Button Pendant takes more punishment — cuts replacement costs.
- **NEW** Grooved Drum increases cable life.
- **NEW** Improved Motor Brake.

P&H ZIP-LIFT

handle it "thru-the-air" at lower cost

See how dozens of handling problems have been solved by the Zip-Lift. This picture-filled book of ideas tells the story. Write for your copy of Bulletin H-20.

PLUS THESE ADDED VALUES:

SAFER — Full magnetic control with current reduced to 110 volts at the push-button. Crane type limit switch and large double brakes provide maximum safety. No open wiring.

LIFETIME CONSTRUCTION — Precision built — shaved gears running in oil—grease-sealed antifriction bearings—fully enclosed, moisture-proof, dust-proof, acid-proof.

SMOOTHER OPERATION — Motor specifically built for hoist service — to withstand frequent reversal. Loads controlled within a fraction of an inch.

ALERT SERVICE — Immediate stock delivery from qualified dealers everywhere — backed by 18 branch offices and 8 warehouses.

The Zip-Lift is America's biggest selling wire rope hoist.

P&H ELECTRIC HOISTS
4514 West National Avenue
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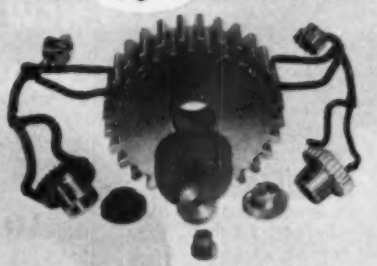
EXCAVATORS • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • CRAWLER AND TRUCK CRANES • DIESEL ENGINES • CANE LOADERS • PRE-ASSEMBLED HOMES

Mass. Gear & Tool Co.



for FAST SERVICE on all types of
MEDIUM AND SMALL SIZE GEARS

Many members of the Mass Gear organization have been with the company since it's founding twenty-eight years ago. They have grown up with "Mass Gear" . . . in planning, producing, inspecting and shipping.

Their long-experienced "know-how" has been concentrated on the interpretation of customer requirements and in meeting them intelligently and promptly.

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If you have a gear problem, let Mass Gear help you. Write for a free catalog to MASSACHUSETTS GEAR and TOOL COMPANY, WOBURN, MASS.

How to read with
your eyes open for business

Read the ads! Every issue of this magazine contains ads that offer valuable services and useful products by which your business may be run more profitably.

The time it takes to read all the ads is time well spent. One ad alone can pay off — by informing you of new developments and new sources of supply, by helping you do a more efficient job. For example, you may locate one machine that will cut your production costs, or step up your output. Or you may discover that the equipment you've been waiting for is now available.

This magazine displays more ideas and merchandise than a trade exposition. Make every issue your buyer's guide. Read the ads as well as the articles. That's reading with your eyes open for business.

HEADQUARTERS FOR BUSINESS INFORMATION

McGRAW-HILL publications

F-22

lem lies in trying to educate all employees in the understanding that while management realizes an occasional mistake may be made by any man, what management is really interested in is holding down the ratio of mistakes. Another factor in healthy control is for a supervisor to stack up a record for patience and fairness in the face of any reasonable number of mistakes, but at the same time to obtain and maintain a reputation for dealing much more severely with men who are dishonest enough to try to hide their mistakes and spoilage.

Another thing must be remembered is that a supervisor must have and maintain the best possible understanding of the inner reactions of each of his men. A man who is phlegmatic, who "has a hide like an elephant," and in addition is definitely more careless than he should be, will need somewhat more rigid treatment in order to hold him in line than a man who is highly conscientious, and whose even-greater-than-healthy concern puts him on a nervous strain which may have caused, or may have been contributory to, the mistake he has made. We have even known of wise supervisors who have advised such men "not to worry too much about it," and perhaps even to tell of some little mistake they have themselves rather recently made. Granted one can easily go too far on this line, it still has its occasional uses.

The entire problem is admittedly a touchy one, and is not the same in any two shops. It inevitably varies with the human factor wherever it is found. The key to the situation is a proper balance of diplomacy and discipline, and these two factors will vary in degree with almost every employee involved. No supervisor will ever arrive at a perfect balance in such a situation, but every supervisor can shoot at perfection. The more assiduously and continuously he aims at it, the more nearly he will be able to approach it.

John E. Hyler
Peoria, Ill.

•

BY APPOINTMENT ONLY

How can Al give his full attention to the men *when they need him* if he is going to see each in turn according to an appointment list? He cannot possibly attend to all his men *when they need him* in the shop if he has a lot of other things to attend to in the office. Then some men must wait for him. They have questions to ask about their jobs that require imme-

You wouldn't hunt rabbits with a cannon!

CONTACTOR — Device for repeatedly establishing and interrupting an electric power circuit (NEMA definition).

RELAY — Device operative by variations of one circuit to effect operation of device in same or other circuit (NEMA).

... So why use a BIG contactor to do this relay's job?

Some control users are hunting rabbits with a cannon . . . when they use a power contactor to do a small relay's job. Sometimes, this is done as an escape from previous troubles with inadequate relays.

Nevertheless, it is poor engineering! When you add size you add weight . . . and also wear and tear.

Why pay extra money and waste panel space with a power contactor, when over 1,000,000 Allen-Bradley solenoid relays have proved themselves entirely adequate for any relay service.

Better investigate why Allen-Bradley relay users enjoy such trouble-free performance. Just ask for Bulletin 700. Allen-Bradley Co., 1316 S. Second Street, Milwaukee 4, Wisconsin.

A-B

ALLEN-BRADLEY

BULLETIN 700 RELAYS

QUALITY

450 M R

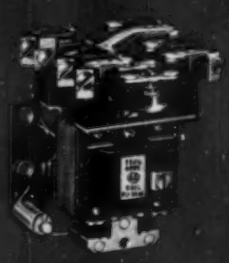
Over 1,000,000 ALLEN-BRADLEY RELAYS

in precision control applications

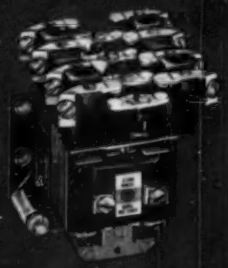
Ten hundred thousand relays are a lot of relays . . . all at work on machine tools and other responsible jobs . . . that's the success story of Allen-Bradley Bulletin 700 Solenoid Relays since they were introduced, eighteen years ago. Ask about them . . . anywhere . . . and you will find Bulletin 700 Solenoid Relays are dependable . . . accurate . . . consistent . . . long lived . . . and trouble free.

Don't buy a contactor to do a relay's job. Standardize on Bulletin 700 Relays . . . and be safe.

Allen-Bradley Co.
1316 S. Second St.
Milwaukee 4, Wis.

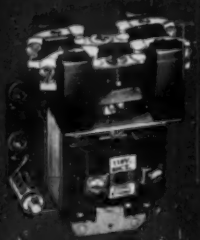


Bulletin 700—Type BR 700, 3 Pole Mechanically Held Relay.

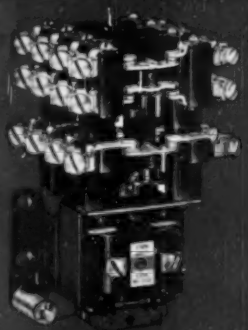


Bulletin 700—Type B 400, 4 Pole Standard Relay.

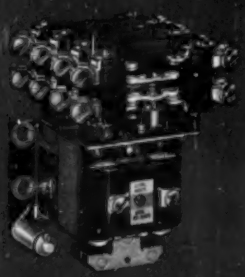
Bulletin 700—Type CL 200, 1 Pole Low Coil Current Relay.



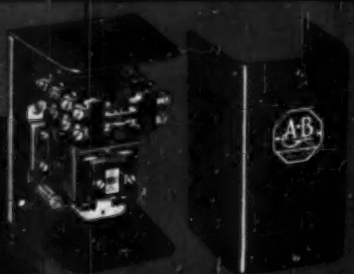
Bulletin 700—Type B 200, 2 Pole Solenoid Relay.



Bulletin 700—Type BX 840, 8 Pole Universal Solenoid Relay.



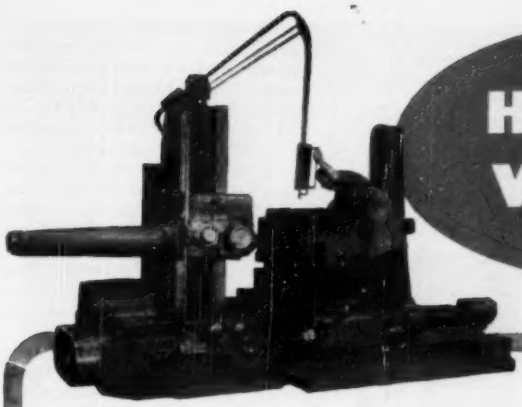
Bulletin 700—Type BX 440, 4 Pole Universal Solenoid Relay.



Bulletin 700 relays are available in Types 1, 4, and 7 enclosures for mounting on special control panels.

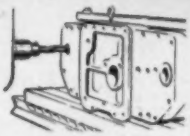
ALLEN-BRADLEY

QUALITY

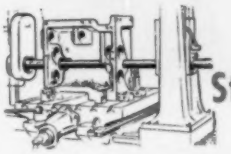


HERE'S LUCAS VERSATILITY

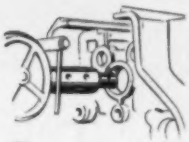
Accurately spaced drilling and boring . . .



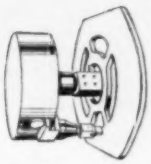
Line boring . . .



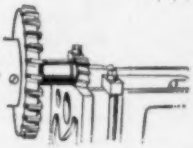
Stub boring . . .



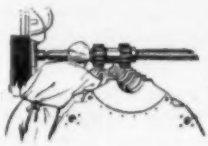
Facing . .



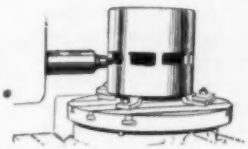
Face and end milling . . .



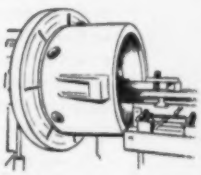
Milling with arbor . . .



Milling with power rotary table . . .



Turning . .



. . . just part of a day's work for a Lucas horizontal boring, drilling and milling machine . . . the precision "one man machine shop." Not just a highly accurate tool room machine, but big and rugged for production work too. So versatile and adaptable, it is rarely idle in any shop.

Mechanically controlled 3" and 4" spindle models. Also 4", 5", and 6" spindles with remote all-direction electrical controls. Work ranges are from 36" x 36" to 94" x 84". All sizes available with either two-way or four-way beds, and feature high and low speed ranges to a single spindle. *Available with automatic power positioning dial indicators for repetitive, close tolerance work.*

Write for descriptive literature.

LUCAS of CLEVELAND

LUCAS

Precision

HORIZONTAL BORING, DRILLING AND MILLING MACHINES
LUCAS MACHINE DIVISION, THE NEW BRITAIN MACHINE CO.
CLEVELAND 8, OHIO

Workers get clean faces, employer lowers fuel bills with ROTO-CLONE

One of 8 Type N Roto-Clones serving buffing room. Unit mounted on roof to conserve space.

Partial View of buffing room

THIS large buffing room of a Bridgeport, Conn. manufacturer processes over 850 varied products of different shapes. Equipment includes dial buffers, arbor buffers, buffing lathes and polishing machines.

Previous dust control methods gave the workers only partial protection. In addition, exhausted air was not cleaned sufficiently to permit recirculation. Result—high heating costs, and drafts resulting from open window ventilation.

With the installation of a dust control system consisting of 8 Type N Roto-Clones,* all problems were solved. Working conditions were improved to the point where buff operators, for the first time, had clean faces. Because of Roto-Clone's high efficiency cleaning, exhausted air can now be recirculated to the working areas during the winter months. Result—savings in fuel that over a three year period will offset the difference in cost between Roto-Clone Type N wet separation and other dry separation methods.

Roto-Clone dust control returns dividends in many ways—and there's a type and size to meet every problem. Ask your local AAF representative for copy of Bulletin No. 270 describing Roto-Clone's many applications or write direct to—

AMERICAN AIR FILTER COMPANY, INC.
207 Central Avenue, Louisville 8, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

AAF

ROTO-CLONE®
DUST CONTROL EQUIPMENT

•ROTO-CLONE is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydrostatic precipitator types.

diate answers. Are they going to stop working until Al comes around? An appointment list of that kind would certainly lower the efficiency of the department, and I don't think this is what he wants. No, this must be wrong; Al is going overboard.

Appointment lists should be reserved for the higher officials, who, due to important business, cannot possibly attend to their subordinates whenever the latter get a whim to see someone. Usually such visits concern matters which have no immediate bearing on production, therefore may be considered later on.

A capable leader is the man who is able to drop what's in his hands and pay attention to something else without losing contact with the first issue. I cannot see why time should be lost if Al is able to answer two or three questions at once.

I don't think it is good to be too formal in any kind of production; the men are probably not educated to diplomatic manners, and it would put a great strain on their feelings.

If this is a new arrangement born in the brain of somebody who thinks he knows everything about machine-shop organization, it should not be accepted before some benefit is proved to be derived from it, or before the men in the shop demand it.

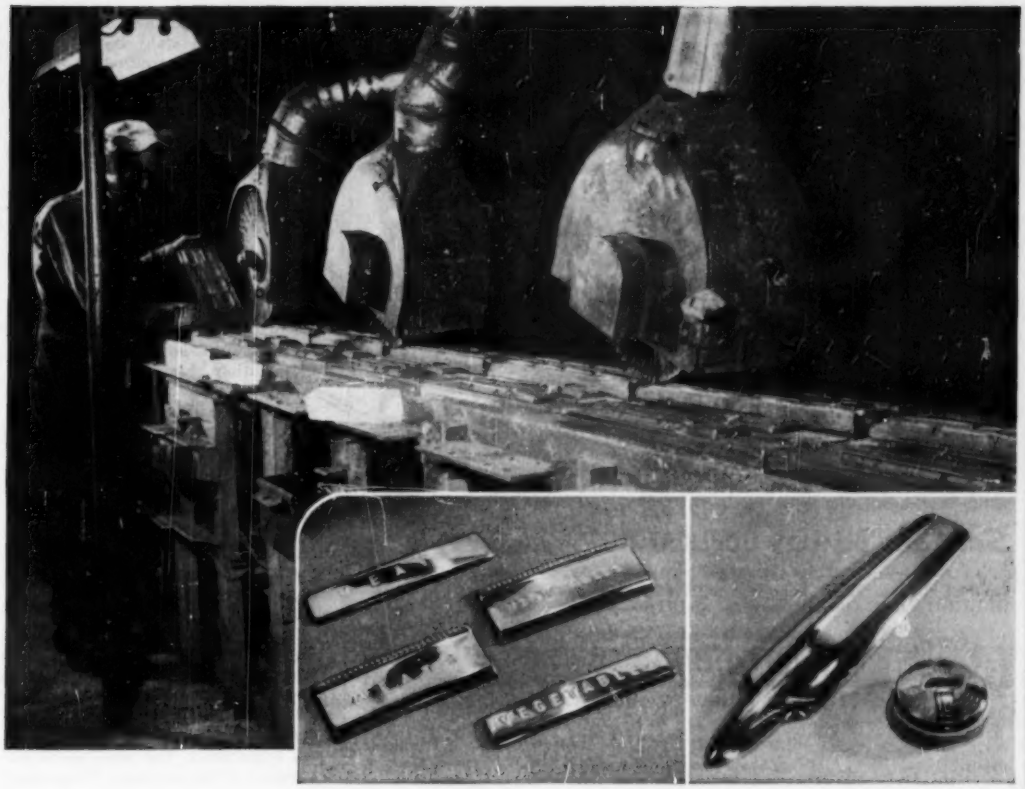
A. E. FRISTEDT,
Stockholm, Sweden

•

EMPLOYMENT PREVIEW

THERE was a time that most of us accepted the employment man. He was a good fellow. Whenever you wanted someone brought in, you called him up and asked him to bring in so and so and put him through the ropes. If he was a friend you got him in pretty easily. If you wanted to get rid of someone, he fixed it—sure he had them transferred or he got rid of them. The employment

"So you played football at college, eh! . . . good! . . . I'll put you on the kickpress."



Applies sales appeal to stainless steel ...*Automatically*

RICH, lustrous finishes . . . the silent salesmen that highlight customer preference for your products . . . are now produced automatically, using Osborn Power Brushes.

Shown above are typical cut and color operations at the plant of a leading producer of polished and plated parts for the automotive and appliance industries. Trim parts formed from stainless steel are fed on an endless belt under rotating heads equipped with Osborn Buffbrushes* using abrasive compound. High finishes on these parts are mass produced with a minimum of handling . . . at a minimum of cost.

When you polish stainless steel, cold rolled steel or other metal parts, an **OBA** (**O**sborn **B**rushing **A**nalysis) may show you how to improve the quality of your work, increase your production and minimize rejects with power brushing. The services of the **O**sborn **B**rushing **A**nalyst for *all* finishing and cleaning problems are backed by Osborn's extensive technical facilities and are yours for the asking. Simply write *The Osborn Manufacturing Company, Department 310, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

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CAN YOU IMPROVE YOUR FINISHES AND CUT COSTS BY BRUSHING?

LOOK FOR THE NAME OSBORN RECOGNIZED EVERYWHERE FOR PROGRESS IN FINISHING METHODS

di-acro PUNCH

NEW DOUBLE PURPOSE PRESS

Available in two sizes, 6" and 12" throat depth

Now you can punch holes of various shapes as large as 4" diameter in 16 gauge steel—also blank, draw, emboss, form—all with the new DI-ACRO Punch. It is ideal for both experimental and production work.

The precision ground triangular ram of this double purpose press prevents punch head from turning, assuring perfect alignment at all times for accuracy in duplicated parts.

A Turret Stripper of exclusive DI-ACRO design automatically strips material from punches of all shapes. Roller Bearing cam action develops 4-ton pressure with minimum effort. Adjustable gauges assure exact location of holes.

Send for **"DIE-LESS DUPLICATING"** *Catalog*

Gives the full story of the DI-ACRO Punch, and also DI-ACRO Benders, Brakes, Shears, Rod Parters, Notchers, as well as the new DI-ACRO Vari-O-Speed Powershear and Hydra-Power Bender.

DI-ACRO is pronounced "DIE-ACK-RO"

DI-ACRO DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

311 EIGHTH AVENUE • LAKE CITY, MINN.

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Open up production bottlenecks with Sterling Speed-Trol Electric Power Drives.

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man was a fine fellow for a number of reasons: you could chat with him and there was a mutual exchange of things in general. At the smoker or shop dinner he was a good mixer. If he had a desk it was discarded by some other department. If he had a file it was one that had been used by the shipping or purchasing department. We liked him because he did all the dirty work. We did not think of him as a staff man but he was.

However, it was not very long before we had organization of another type. It was the welding together of a lot of personalities into a smooth functioning unit. We had organization that deals in human emotions, ambitions and personal effectiveness. We found ourselves with the personnel department who had varied tasks. The personnel department hired employees, but they hired them on behalf of the management, of which the foreman is a part. The aim was to get the right man for the right job, and then to foster the smoothest possible relationship between him and the foreman.

In many plants when the foreman requisitions new employees he advises the personnel man or employment man just what skill is desired. The employee's first contact is with the company interviewer who takes his application. The applicant's impression of the company, for good or bad usually dates from the first few minutes of the interview. The interviewer gets the applicant's background and experience. He is courteous and kind and explains the company's policy in regard to hiring, the working conditions, rates of pay, vacation and other things of interest. If the position open calls for a skilled or semi-skilled operation the personnel or employment man then arranges an interview with the foreman after making known the applicant's background.

The foreman then interviews the applicant and makes known his decision to the employment man. If he is acceptable to the foreman he is then escorted by the employment man around the plant, who points out the lockers, cafeteria and library. Benefits offered by the company are explained to him—the insurance, health plan, credit union or the sick benefits. He is then turned over to the foreman who sees to it that he is introduced to his fellow workers. We then assign him to the job he was hired for. Here is where we make sure he knows all there is to know about the job.

Many supervisors make the mistake of simply showing the man the

A Lubricant that Works from sub 0 to 3000 plus

ORDINARY lubricants gum up at extremely low temperatures or break down at extremely high temperatures . . . but not Acheson's specially processed **"dag"** colloidal graphite!

This versatile material is dispersed in organic and inorganic carriers for positive transmission to the zone of lubrication . . . for effective concentration at those points . . . for friction-fighting that can't be beat!

"dag" colloidal graphite is unique in its combination of properties and uses. It is very slippery and extremely durable, anti-corrosive, gas adsorbent, chemically inert and, of course, highly resistant to heat.

In deep piercing you get smooth forgings, close tolerances and reduced wear on dies. In casting and mold stripping you get smooth surfaces, clean parting, fewer rejects; and additional mold life.

In forging you minimize scaling and sticking, improve finish, lengthen die life.

In stretch-forming you reduce tearing and rippling. In wire-drawing you get uniform diameter, better finish and greatly extended die life.

Brass, bronze, aluminum, magnesium, carbon steel and stainless steel . . . wherever your fabrication problems are friction and heat . . . **"dag"** colloidal graphite reduces the one and resists the other.

The NEW Acheson Bulletin #426 on the Use of **"dag"** Colloidal Graphite in Metalworking operations is just off the press . . . a copy is ready for you if you will fill in and mail the coupon.

Acheson Colloids is equipped to do custom disintegrating, dispersing, and stabilizing of solids in a wide variety of vehicles. If you are in need of this type of service, tell us about it. We may be able to help you.

ACHESON COLLOIDS CORPORATION
Port Huron, Michigan

☐ Send me the NEW Metalworking Bulletin #426

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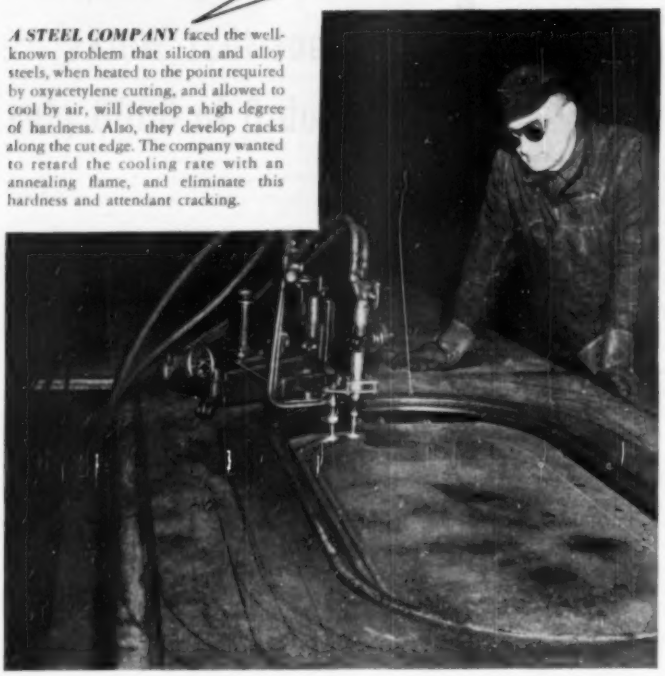
. . . also Acheson Colloids Limited, London, England

Simultaneous Flame Cutting— Softening eliminates cracks on certain steels



A STEEL COMPANY faced the well-known problem that silicon and alloy steels, when heated to the point required by oxyacetylene cutting, and allowed to cool by air, will develop a high degree of hardness. Also, they develop cracks along the cut edge. The company wanted to retard the cooling rate with an annealing flame, and eliminate this hardness and attendant cracking.

A. H. Yoch. Airco Technical Sales Service Specialist, suggested and assisted in developing equipment and technique for flame softening the steel simultaneously with the machine gas cutting operation.

He devised a special torch set-up (as illustrated) with the annealing flame following closely, in a fixed position, behind the cutting flame. This retarded the cooling, eliminated the need for manual softening, and resulted in a faster, superior annealing job. By retarding the cooling rate with an annealing flame, the hardness and attendant cracking were dispelled.

Further, the speed with which the Airco No. 4 Radiagraph operates saved many production hours—a money-saving performance fact that is constantly winning new friends for this unique gas cutting machine.

For more information about flame cutting and softening, or for Technical Sales Service on a problem involving the use of the oxyacetylene flame or electric arc, call your nearest Airco office.

AIRCO **AIR REDUCTION**

Offices in Principal Cities

TECHNICAL SALES SERVICE—ANOTHER AIRCO PLUS-VALUE FOR CUSTOMERS

necessary steps of operation. We are all creatures of habit and usually the trainee will continue these first steps as long as he is on that operation. The good supervisor will watch for any unnecessary steps or motions. We must follow through and make sure the worker or trainee is doing the job in the correct way, or the method that is less tiring. This is the harness within which men work for a smooth functioning unit.

A. E. Salmons
Philadelphia

•

THE MOST successful method of hiring and one which has become more popular in the last few years is one in which potential employees are screened by the Employment Manager and when a likely prospect shows up, he is turned over to the foreman or supervisor for checking

This type of employee hiring is quite successful because the prospect is interviewed by two persons and probably for two different reasons. It also allows the foreman or supervisor to see what he might be getting for an employee. In this system the final decision rests with the foreman or supervisor. However, his valuable time is not taken up by the screening of prospects.

The chance for the prospect to talk with his boss-to-be is a good employee-relationship move. It allows the prospect to get a picture of more than one person in the organization. He gets a chance to determine first hand before going to work as to whether he feels he can get along with the boss. This not only reduces the turnover for the company but also protects the workers' employment record.

Unfortunately for the person looking for work, a record of varied employment means little to the average supervisor. The supervision of a company frequently believes that men should not change jobs. They should always be a one-track employee who stays on the job day in and day out without any thoughts of applying his skill to other fields which frequently might be even better adapted to his abilities.

Much is lost by this attitude of industry, and many workers are not as advanced as they should be due to this universal feeling.

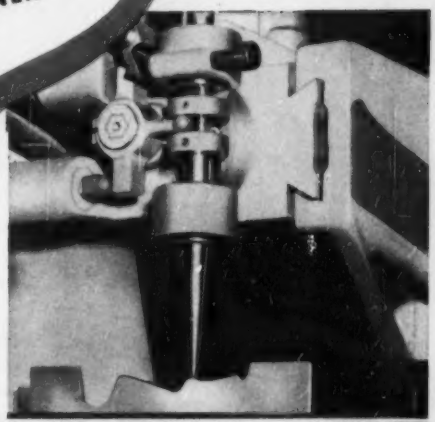
Therefore, the policy of having employment departments has not reduced the foremen's over-all final say-so on most of the important job placements. Rather it is a tool for him because it screens out the men he would also screen out. It probably sends to him men who are acceptable

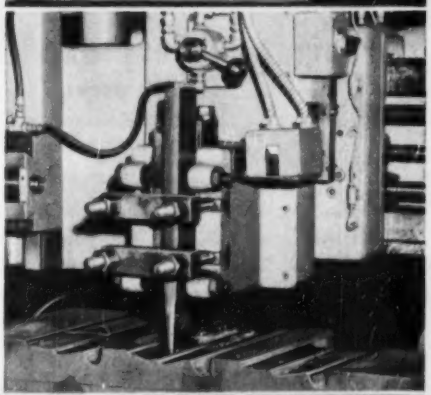
Rockford HY-DRAULIC TRACER

ON ROCKFORD HY-DRAULIC PLANER

Cuts Time 40%

CONTOUR MACHINING SHEAR KNIVES





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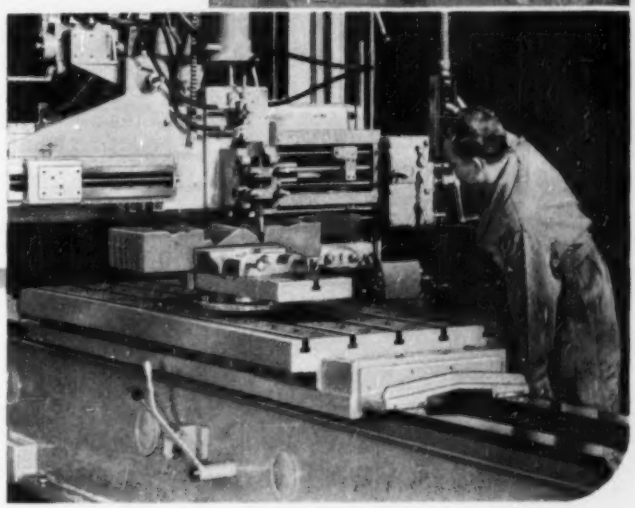
These shear knives, as shown, are finish machined in 2 cuts, 6 knives per load, following an accurately finished template. Both edges of the knives are formed and total machining time is 40% less than previous method.

Similar production savings can easily be applied to other duplicating work—either contour or full-form—through the use of this "Performance Perfected" Rockford Hy-Draulic Tracer. Have your machine equipped with this cost saving device. Send us your problems.

Send for our new bulletin describing features and applications of the Rockford Hy-Draulic Tracer.



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OUT OUR WAY
OWOOH! FOR NINE YEARS HE'S BEEN STANDIN' ON SOL-SPEEDI-DRI AN' HE DON'T KNOW WHAT IT'S FOR!
BECAUSE IT'S NONE OF MY BUSINESS! THEY GOT MEN DOIN' THAT!
WHY IS IT SOME PEOPLE HAVE GOTTA BREAK A LEG OR ARM OR SUMPIN' BE-FORE THEY BOTHER TO FIND OUT ABOUT SOL-SPEEDI-DRI?
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to the company and all he has to do is to see whether he feels that the man would fit into the working group which he supervises. If foremen in an organization feel that they are being bypassed, company management is at fault and some methods of correction should be enacted to see that the foremen are better trained and instructed on company policies.

Charles D. Townsend
Ft. Wayne, Ind.

NEW BOOKS

RUNNING A REGAL—*Published by The R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio. 14th Edition. 92 pages, 8½x11. Price 50¢.*

The latest edition of this book, which has been distributed for 15 years for apprentice training, has been completely revised. It contains, for the first time, an exploded parts section.

With this addition the apprentice can take the various units apart, study, and reassemble them. In addition, this section will prove valuable to Regal owners in ordering spare parts.

•

NEW AMERICAN STANDARDS. Published by the American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y.

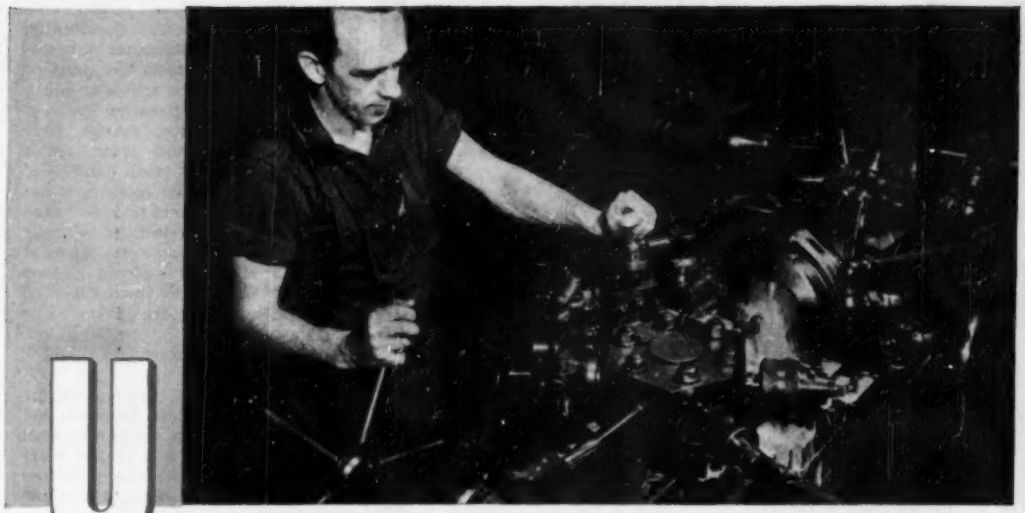
PUNCH AND DIE SETS FOR TWO-POST, PUNCH PRESS TOOLS. *B5.25—1950. Price $ .75.*

This design and dimensional standard covers the types and range of sizes in general demand by tool designers and used by toolmakers for the mounting of punch-press tool details.

TWIST DRILLS (STRAIGHT SHANK AND TAPER SHANK) *B5.12—1950. Price, $ .65.*

Tolerances have been set on various features of drills for interchangeability; taper-shank drills have been included; diameters of straight-shank drills now correspond to the actual sizes purchased and used in industry; and lengths of number, letter, and fraction-size drills are now the same.

SINGLE-POINT CUTTING TOOLS AND TOOL POSTS. *B5.22—1950. Price $1.25.* Besides being a complete revision of the 1939 Standard on Terminology and Definitions for Single-Point Tools and the 1943 Standard on Tool



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You can get just the advantages you want for your product when you use Reynolds Aluminum screw machine stock. For in the aluminum family of metals there are alloys that match the strength of steel, the free machining of brass and the finish of stainless steel.

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Reynolds has a line of screw machine stock that offers these qualities in many combinations. An alloy that suits your job best can be recommended easily, when you let us analyze your requirements.

There's a distributor in your area who can take care of your requirements. He is listed under "Aluminum" in the classified 'phone book. Call him for prompt service on Reynolds Aluminum screw machine stock and other aluminum products such as ingot, sheet, wire, rod, bar, structurals, extrusions, pipe and tubing. Or write direct to Reynolds Metals Company, 2523 South Third St., Louisville 1, Ky.

***YOURS FOR THE ASKING**—A copy of "Machining Aluminum Alloys" will be sent to you without charge when requested on your company letterhead.*

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R317-T4—Fine finishes at high speeds. Free cutting, fine chips, good strength. Excellent for screw machine work.

11S-T3—Free machining. Longer tool life but slightly less strength than 17S-T4 and R317-T4. Good formability of machined parts.

17S-T4—Excellent finishes. Fine for general purpose machining. Good corrosion resistance and strength.

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24S-T4—For simple machine work. Chips long and curled. Stronger than above alloys. Smooth finishes.

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Although perhaps best known for our *special* HY-TEN Alloy Steels, Wheelock, Lovejoy carries a full line of *standard* steels *in stock* for fast, dependable service from our warehouses. These standard grades include: C-1117, A4615, E4617, A4620, A4140, A4142, A4145, A4150, A4340, etc.

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WL *steels are metallurgically constant. This guarantees uniformity of chemistry, grain size, hardenability — thus eliminating costly changes in heat treating specifications.*

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Shanks and Tool Posts, this 1950 Edition contains a considerable amount of new material. Specifically, it defines and illustrates the different classes of tools, the parts of those tools, and the angles at which they are used. It gives the standard dimensions for tool shanks, tool-post openings, and lathe center height for solid tools and tool holders. In the new sections of the standard, single-point tools are listed and classified according to their shape, construction or use. Sizes of the six styles of sintered carbide tips, (together with the commercial catalog numbers) are given.

INVOLUTE SERRATIONS. *B5.25—1950. Price $1.*

The standard not only replaces the SAE Serrated Shaft Standard, but provides a uniform, easily fabricated set of serrations that can be made by several manufacturing processes. The pitches included are 10/20, 16/32, 24/48, 32/64, 40/80, 48/96, 64/128, 80/160 and 128/256, complete from 6 to 100 teeth only for the first three. The scope is from 0.10 to 10.00 dia. The pressure angle for all serrations is 45°.

20° INVOLUTE FINE-PITCH SYSTEM FOR SPUR AND HELICAL GEARS. *B6-7—1950. Price, $1.50.*

This new standard closely follows the 1932 Spur Gear Tooth Form Standard with a slight increase in the hole depth to allow for the greater proportional clearance necessary in fine-pitch gears. The series includes gears of 20-DP and finer having a 20° pressure angle. The range of pinion sizes has been extended down to 7 teeth because pinions of this size are used in many servo-mechanisms.

FINE-PITCH STRAIGHT BEVEL GEARS. *B6.8—1950. Price, $1.*

This standard covers generated straight bevel gears: (a) of 20 DP and finer, (b) for all shaft angles, and (c) with the number of teeth equal to or greater than 16/16, 15/17, 14/20, 13/30 90° shaft angle. Tooth thicknesses correspond to those generated by a crown gear in which the tooth thickness and space width are equal. Maximum face width is limited to three tenths of the cone distance, or 8 in., whichever is smaller.

DESIGNED FOR FINE-PITCH WORM GEARING. *B6.9—1950. Price, $1.50.*

This new standard covers worms and worm gears with axes at right angles, comprising cylindrical worms with helical threads, the worm gear being hobbed for fully conjugate

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- Cuts setup time in half
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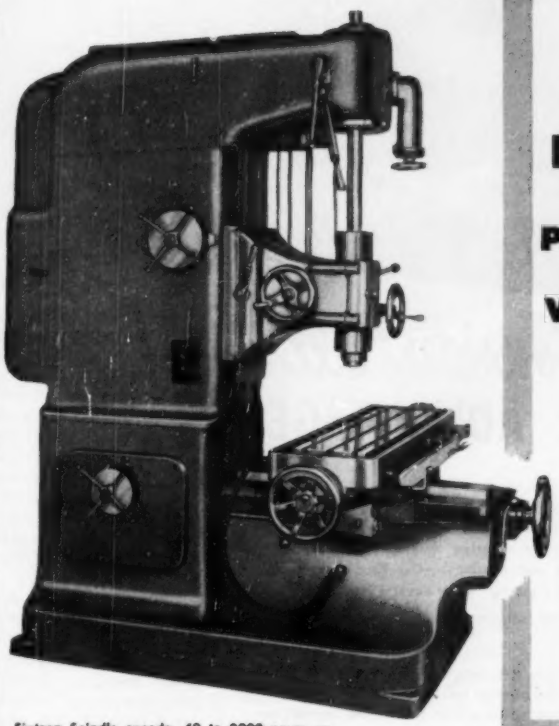

Sixteen Spindle speeds, 40 to 2000 r.p.m.—9 Spindle feeds, .005" to .010"—100" table traverse per minute in both directions—16 Table feeds, 3/16" to 20" per minute

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If you want versatility in a surface roughness measuring instrument, you'll want the Profilometer.

2. By no other measuring method can you get roughness ratings *as fast* and *as accurately* as with the Profilometer. Its normal tracing speed is much faster than that of any other instrument of its type. Throughout the tracing operations, direct dial readings provide precise measurements in microinch units (millionths of an inch).

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tooth surfaces. Examples of fine-pitch worm and worm-gear calculations are included.

HIGH-STRENGTH HIGH-TEMPERATURE INTERNAL WRENCHING BOLTS. *B18.3—1950. Price $0.35.*

This standard is intended for use in high-strength applications such as steam turbine work, where fasteners are subjected to temp of 800 to 900 F for long periods. Fasteners have larger head proportions than standard socket-head screws.

CAST-BRASS SOLDERED JOINT FITTINGS. *B16.18—1950. Price, $0.75.*

This 1950 revision of the Soldered-Joint Fittings Standard of 1941 was developed because the expanded use of this type of fitting has resulted in many applications outside the field of plumbing and plumbing equipment.

•

EFFICIENT MILLING. *28 pages. Published by the Milling Cutter Div., Metal Cutting Tool Institute, 405 Lexington Ave., New York 17, N. Y. Price $1.*

A great deal of practical experience of eight leading cuttingtool specialists is packed within the covers of this report. Their object was to lay the basis for selecting the best tool material for a specific job and applying it in a suitable manner.

The report begins with a discussion of over-all economics in milling. A chart shows how to calculate the total cost per piece for a certain operation. This is followed by a formula and a chart for setting forth a tool-cost analysis.

Considerable information follows on high-speed steels by typical analyses, the cast cutting alloys, and the carbides. A summary of carbide-grade recommendations for various purposes should be helpful, particularly because the products of the various carbide manufacturers are cross-indexed with respect to roughing and finishing operations on various materials.

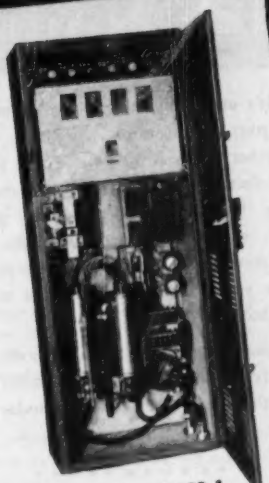
One of the most valuable chapters covers selection of suitable tool material with respect to type of operation: angle milling, end milling, slab milling, etc. These observations are tabulated for ready reference.

Speeds, feeds and horsepower for milling cutters, made of or tipped with the various cutting materials, conclude the report. For example, typical cutting speeds for steels of 100 to 400 Brinell are included. Suggested starting feeds *per tooth* for seven operations should pave the way toward more efficient milling.

SQUARE D *Electronic* WELDER CONTROL REDUCES PRODUCTION COSTS!

Production cost was a vital factor when Nash tooled to mass-produce its new Rambler series cars. Gun welders were equipped with Square D electronic controls to meet four important objectives—continuous production, consistent results, high speed, reduced maintenance cost.

Square D's industrial construction assures simpler inspection and maintenance. Firing of power tubes is synchronized to minimize transients and ease the stress on welder transformer windings. Substantially more speed is available than is normally required for body assembly welding.



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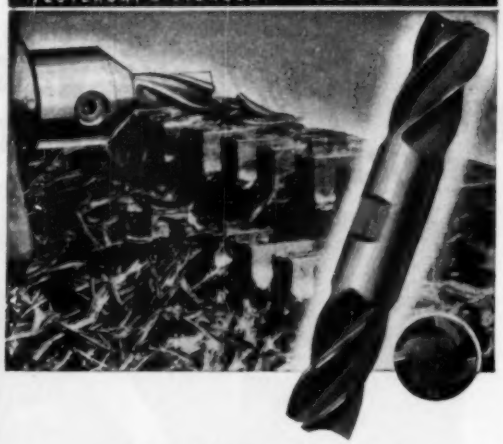

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It's the "teeth" in Weldon End Mills that tell the story of more production and bigger profits on your jobs.

Weldon pioneered in producing *scientifically designed* teeth for end mills, a step over 25 years ago that opened the door to higher speeds, and faster feeds.

After lengthy experiment and study, the *tooth shape* and *spiral angle* on Weldon End Mills were radically altered from conventional styles. The result was a tooth, that *allows chips to curl out without clogging* and *insures better performance* and *longer life* for the tool.

Call the Weldon representative for more information.

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Gear errors and Gear noise

should be discovered long before the gears reach final assembly . . .

There is a profit in scrap for the scrap dealer, but most certainly not for the gear manufacturer who suddenly discovers that an entire lot of gears have to be scrapped because they fail to meet tolerance requirements or because they are too noisy.

If economy is important in your plant, the time to find out about machining errors is right at the machine which causes the trouble—not after all the subsequent operations including heat treatment have been completed and the gears assembled in some power unit.

The best insurance against high cost of scrap gears is the use of gear checking machines right down there in the plant where the gears are being produced and where they can be checked periodically by the machine operators.

The Red Ring Gear Checker quickly reveals any dimensional errors and the Red Ring Gear Sound Tester immediately puts an accusing finger on noisy gears. Both machines have laboratory accuracy, they can be used anywhere in the plant or inspection department and they prevent a great deal of waste.

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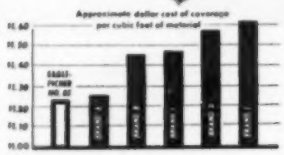
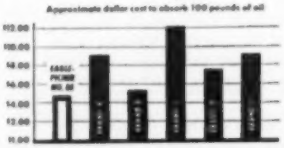
Comparative Coverage Costs



Comparative Absorption Costs



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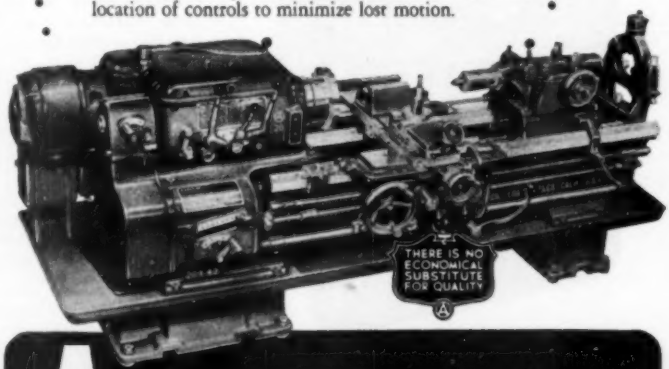
is immediately apparent the first time a machinist puts the tool to the work. Velvet-smooth control action—continuous flow of power at the cutting tool without vibration or chatter.

PRACTICAL VERSATILITY...
permits a wide variety of operations with all types of tools on any kind of stock.

THE TOOL CARRIES THROUGH...
with precision accuracy from the beginning to the end of each cut. Massive construction throughout maintains absolute alignment.

LONGER LIFE, LESS MAINTENANCE...
reduces to a minimum production shut-downs for maintenance or repair—provides years of added precision work at no replacement cost.

MORE PRODUCTION PER CAPITAL DOLLAR INVESTED...
is assured because of faster speeds—greater ease of operation—ample reserve of smooth power at the cutting tool to handle any work without slow-down—scientific location of controls to minimize lost motion.



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MINNESOTA: "Oakite Compound No. 33 has everything I've used up to now beat a mile. The solvent action on . . . pin grease is remarkable." (auto body parts)

NEW YORK: "Paint appearance uniform; adhesion excellent; costs are down 50%." (radiant wall heating units)

CALIFORNIA: "This cleaner is what we've been looking for." (steel braces and aluminum sheets for truck bodies)

NEW JERSEY: "For removing silver soldering flux and fire scale from brass and copper, Oakite Compound No. 33 is just 100%." (radio antenna parts)

MARYLAND: ". . . perfect removal of welding flash, rust, oil . . ." (wire baskets)

NEW YORK: "This stuff is terrific! Removes grease and rust beautifully and leaves the surface fine for spraying." (sporting equipment)

OHIO: ". . . removes all grease, oil and rust in one operation. This will double painting production." (truck cabs)

NORTH CAROLINA: ". . . gives very nice paint adhesion." (kitchen cabinet parts)

MINNESOTA: "Rust removing is exceptional. No longer necessary to pickle the steel, then scrub . . ." (cabinets and parts for radio transmitters)

CALIFORNIA: "Oakite Compound No. 33 is saving several operations and much time." (small steel parts)

Technical Service Representatives in Principal Cities of U. S. & Canada

METAL finishers using Oakite Compound No. 33 say this new cleaning-phosphating material is just what they have been looking for: a metal-cleaner that combines three important operations into one:

1. **It removes rust** *at the same time that*
2. **It removes oil** *at the same time that*
3. **It prepares the metal for painting**

Oakite Compound No. 33 is great for removing rust, heat scale, tarnish, other oxides, oil, grease, smut, soldering and welding fluxes and identification inks.

Oakite Compound No. 33 develops excellent paint adhesion on steel, cast iron, aluminum sheet and aluminum castings.

For Use in Tanks or by Hand—Oakite Compound No. 33 is great for soak-cleaning metal parts of moderate size; and great for hand-swabbing on large parts like cabinets, doors, tables, tractors and truck cabs.

Often Avoids Pickling—Oakite Compound No. 33 saves money; frequently eliminating separate pickling operations on moderately rusty steel.

FREE For special bulletin on Oakite Compound No. 33, just drop us a note or mail the coupon.

SPECIALIZED INDUSTRIAL CLEANING

OAKITE

MATERIALS • METHODS • SERVICE

OAKITE PRODUCTS, INC.,
26 Thames Street, New York 6, N. Y.

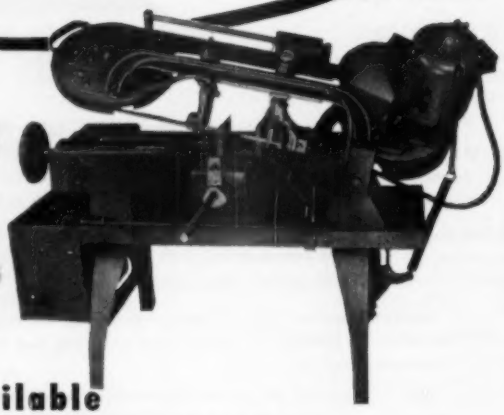
Send me, without obligation, special bulletin A-9842 describing your new metal-cleaner, Oakite Compound No. 33.

NAME.....

COMPANY.....

ADDRESS.....

BIG
saw performance in a compact, economical package



the WELLS No. 5 METAL CUTTING BAND SAW now available with wet cutting system...

The advantages of wet cutting, previously available only on larger machines, can now be had on the Wells No. 5 Utility Model Metal Cutting Band Saw. This proved-in-service system reduces cutting costs by reducing cutting time and permitting more cuts per blade. Self-contained and compact, the Wells Wet Cutting System is completely automatic with convenient controls, and does not interfere with portability. Factory-assembled on new machines or available for installation on your present machine. Get full details from your Wells Dealer or write direct.

Wells No. 8 and No. 12 Saws are available for jobs requiring larger capacity.

Design Details
Wells No. 5 Saw

- ✓ 5" x 10" rectangular capacity; 5" dia., rounds.
- ✓ Three speeds: 60, 90, 130 ft./min.
- ✓ ½ H.P. motor.
- ✓ Quick-acting swivel vise.
- ✓ Fast, accurate, and economical.

Wells saws

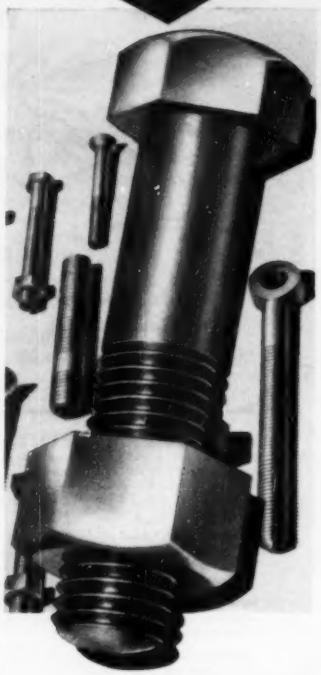
Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
505 ROOSEVELT ROAD, THREE RIVERS, MICH.

First for
BOLTS NUTS STUDS



★ Carbon Steel ★ Stainless Steel
★ Heat-treated ★ Silicon Bronze
Alloy Steels ★ Naval Brass
★ Monel Metal

You can count on a uniform Class 3 Fit when you buy Pawtucket threaded fasteners. Accurately made in standard dimensions — or to your specifications.

BETTER BOLTS SINCE 1882

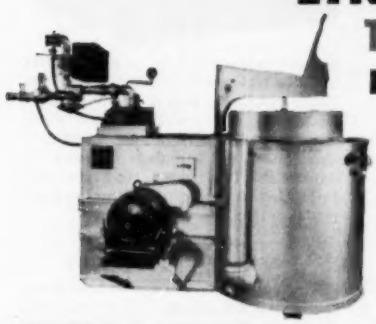
Use Headed and Threaded Fasteners for Economy and Reliability

PAWTUCKET

THE BEST MAN
MANUFACTURING COMPANY
327 Pine Street · Pawtucket, R. I.
THE PLACE TO SOLVE YOUR BOLT PROBLEMS
T. M. REG.

HERE'S HOW...

LINDBERG CYCLONE FURNACES TEMPER SCREWS AT $0.000 093 6 FUEL COST PER POUND



Lindberg Steel Treating Co., Chicago, the world's largest custom heat treating organization and companion company to Lindberg Engineering Co., uses twenty-nine 100% forced-convection Lindberg Cyclone Furnaces for low-cost production tempering of many jobs—from tiny screws to 4 ton charges of forgings.

Here is one typical job, self-tapping screws tempered in one of the nine furnaces shown above (the third one from the front—it has a work chamber 22" in diameter by 26" in depth). Note the low unit cost.

FUEL COST	$0.000 093 6 PER LB.
Weight of charge	1019 lbs.
Temperature	600° F.
Time in furnace	65 minutes
Fuel consumed	159,000 BTU (1.59 Therms)
Fuel cost @ 6c Therm	9½c

Hardness is easily controlled to plus or minus 1 Rockwell "C." Heating is rapid and uniform. Heat is generated in a *separate* chamber away from the charge, *then* circulated by blower through all parts of the work chamber. All work is uniformly heated at the same instant—radiant heat does not reach outside of charge first . . . and center last.

Lindberg Cyclone Furnaces can help reduce the costs and improve the quality of your tempering, annealing, nitriding, stress-relieving and non-ferrous heat-treating. Bulletin 53, *"Lindberg Gas Fired Cyclone Tempering Furnaces,"* tells how. Ask for it. (Bulletin 14 covers *Electric Cyclones.)*

LINDBERG ENGINEERING COMPANY 2445 W. Hubbard Street, Chicago 12, Illinois

LINDBERG **FURNACES**

Threadwell Tools do many jobs

they can do your tough ones

For the answer you've been looking for, call in your nearest Threadwell Distributor. You can get his name as well as complete information by mailing the coupon below.

THREADWELL TAP & DIE CO., Greenfield, Mass.

Send me free Bulletins checked below

Name _____

Position _____

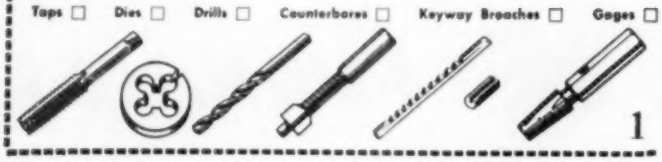
Company _____

Street address _____

City _____ **Zone** ____ **State** _____

Threadwell

Taps ☐ **Dies** ☐ **Drills** ☐ **Counterbores** ☐ **Keyway Broaches** ☐ **Gages** ☐



1

Best choice for 1950!

Your VICTOR Distributor . . . and New Molyflex Shatterproof High Speed Hand Blades

A combination you'll find it hard to beat for good service and lasting quality. Your Victor distributor knows that in a recent test "Molyflex" *averaged 23.8% more metal cut than all the leading brands tested.* He'll tell you that "Molyflex" is unbreakable in a frame . . . and more uniform. He's an expert in solving metal cutting problems.

VICTOR STEELRITE METAL MARKING CRAYONS

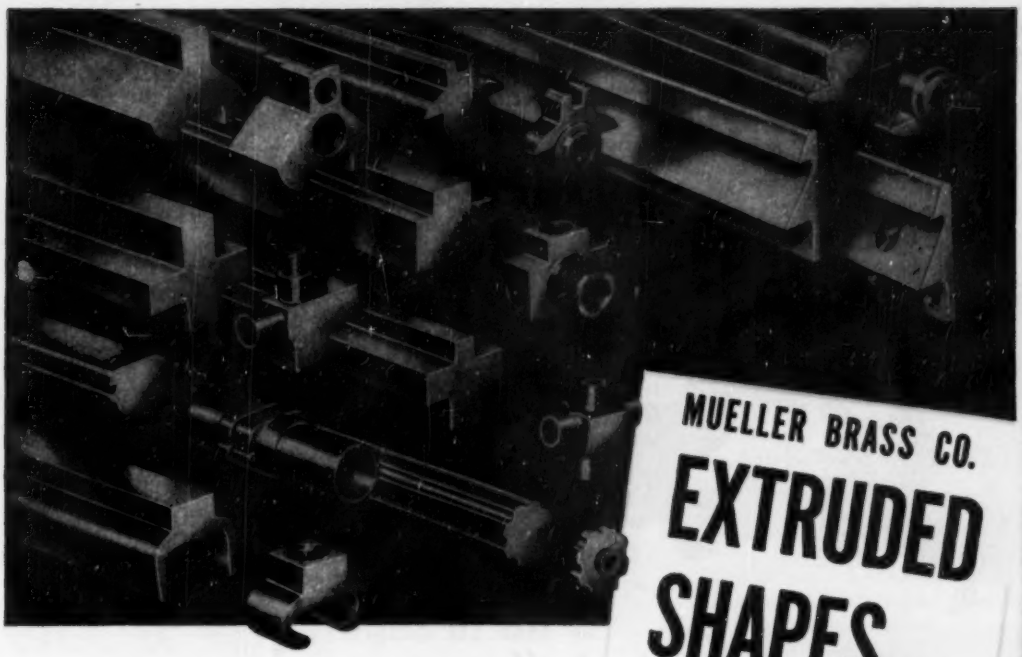
Ask him about our new genuine soapstone metal marking crayons. O.K. on hot, cold, damp or grimy metal. Markings withstand pickling, yet do not affect enamel application.

Be sure to ask for your free copy of the Victor Metal Cutting Booklet and the Victor Wall Chart to get maximum efficiency from metal cutting saw blades.

VICTOR

SAW WORKS, INC. MIDDLETOWN, N.Y., U.S.A.

Makers of Hand and Power Hack Saw Blades Frames and Band Saw Blades



MUELLER BRASS CO. EXTRUDED SHAPES...

can lower your production costs!

REDUCE MACHINING OPERATIONS—LESS WASTE—The extruded shape is similar to the shape of the finished product, in some instances merely requiring a milling and drilling operation to complete the finished article.

SAVES TIME—Surfaces are extruded to precision tolerances and to a mirror-like smoothness. Less time is required for buffing and polishing in preparation for final plating.

LESS SCRAP—The sound, dense, fine-grained structure of the metal and absence of porosity result in less rejects, especially where parts must withstand internal pressure.

LONGER TOOL LIFE—Machinability is better—tools last longer and require less grinding, thus permitting steadier production runs.

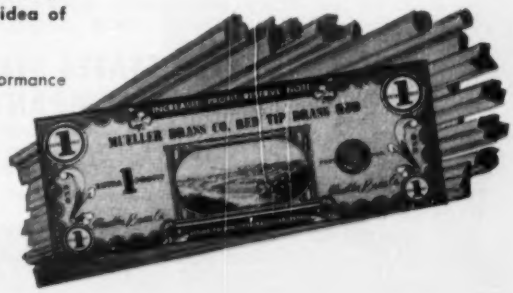
A GREAT VARIETY OF SHAPES AND ALLOYS

The illustrations shown above, of extruded rods and their finished parts, are but a few of the many thousands that can be produced; but they give a general idea of the variety of shapes available.

Do you want more efficient production or better performance of your product? A specially processed rod may be the answer. If you have a problem, please tell us about it, our Technical Engineers and Laboratory are at your disposal.

YOU CAN PIN MORE PROFIT TO YOUR COST SHEET

Mueller Brass Co. Red Tip Brass Rod is a universal, many-purpose, extra-fast cutting Rod. Its constant uniformity saves tools, grinding and "down" time. It actually can be machined at greater speeds than that of which any machine is capable on a continuous production basis. YOU CAN PIN MORE PROFIT TO YOUR COST SHEET BY USING MUELLER BRASS CO. BRASS ROD AND EXTRUDED SHAPES.



MUELLER BRASS CO.

PORT HURON • MICHIGAN

BARS - PLATES - STRUCTURALS - SHEETS - TUBING - REINFORCING BARS - STAINLESS - ALLOY & HI-STRENGTH STEELS - ALUMINUM - TOOLS - SUPPLIES - MACHINERY
SHEETS - All kinds
HOT ROLLED · COLD ROLLED
GALVANIZED · ELECTRICAL
ALUMINUM · STAINLESS · ETC
Plates
CARBON STEEL · STAINLESS
ALLOY · ALUMINUM · FLOOR PLATES
WELDING ELECTRODES

"Complete stocks" . . .

. . . that's only one of the things we mean by Service Plus!

● Many of our customers think of United States Steel Supply as the "department store" of the steel industry. That's exactly what we aim to be . . . a source of supply that always has a large diversified stock of steel, aluminum, tools, equipment and machinery on hand so that customers' orders can be filled promptly. Customers who have shopped around come back to us with comments like these: "Only place we could find what we wanted." "We were hunting an odd size . . . *you had it!*" "U. S. Steel Supply was the only concern with all the stock we needed."

You can depend on us for more than complete stocks, however. *Service Plus* means quick delivery, and instant, courteous attention to any problems you have involving material selection. It means *You're the Boss* and we're going to do our best to keep you satisfied.

U-S-S Carilloy Alloy Steels Manufactured to a Guaranteed Minimum Hardenability

HOT ROLLED AND COLD FINISHED BARS · PLATES · FLOOR PLATE · STRUCTURALS
SHEETS · STRIP · STAINLESS · ALUMINUM · TOOLS · SUPPLIES · MACHINERY

WHEN YOU DEAL WITH US, YOU GET Service Plus!

UNITED STATES STEEL SUPPLY COMPANY

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Headquarters Offices: 208 S. La Salle St.—Chicago 4 Ill.

UNITED STATES STEEL

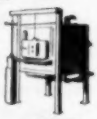
'Surface'

STANDARD RATED FURNACES for TOOL ROOMS

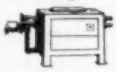
THIS INFORMATIVE FOLDER Bulletin SC-123, is fully descriptive of 'Surface' Standard Furnaces' application to tool room heat treat needs.

ATMOSPHERE FURNACES
Balco, Char-Mo, Atmotrol for clean, scale-free heat treatment.

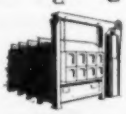
MUFFLE FURNACES
for use with protective atmospheres to prevent scaling and decarburization.



POT FURNACES
for drawing, cyaniding, liquid carburizing, or quenching.

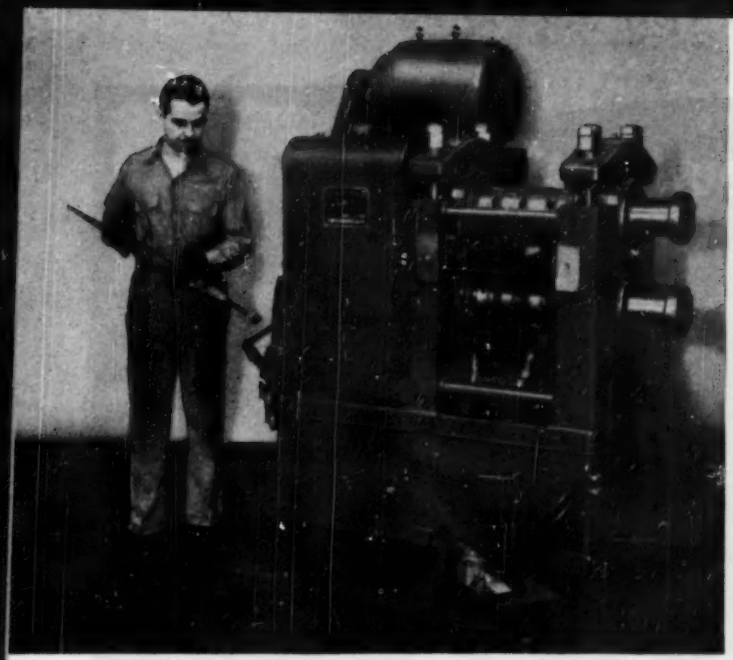


OVEN FURNACES
for general heat treating or heating operations. Direct fired.

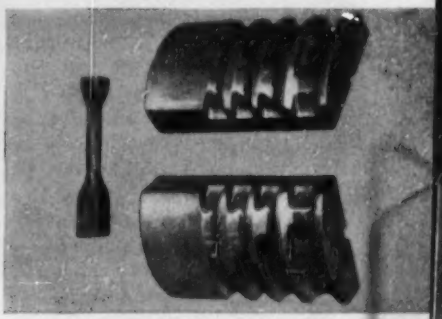


CONVECTION FURNACES
for drawing or tempering of tool steels.

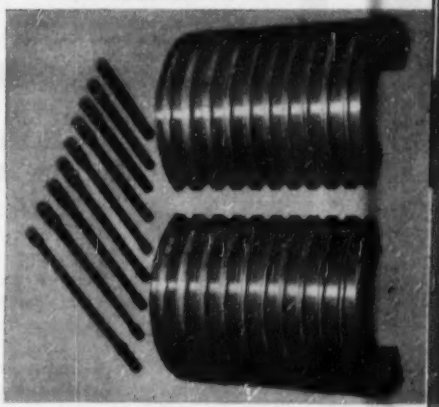
SURFACE COMBUSTION CORPORATION
TOLEDO 1, OHIO



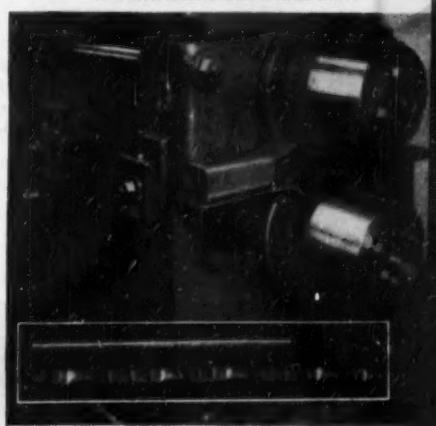
NEW AJAX WIDE ADJUSTMENT FORGING ROLLS



FLAT BACKED SEGMENTAL DIES & CON ROD BLANK



SEMI-CYLINDRICAL DIES & AXLE SHAFT



FULL CYLINDRICAL DIES WITH BLANK BEFORE AND AFTER ROLLING

have the advantages of all 3

Ajax Wide Adjustment Forging Rolls, with the new combination roll shafts, combine all the advantages and economies accruing to the roll method of producing tapered or reduced forgings, and preparing blanks for subsequent forging operations.

FLAT BACKED SEGMENTAL DIES. For short reductions, these economical dies are bolted to the roll shafts between the housings so as to permit quick setting and easy changes. They are economical to make, as most of the machining can be done on both dies simultaneously. They weigh little, can be of high alloy steel. After machining, they can be heat-treated to a high hardness, and the back surfaces can be ground to correct any warpage.

SEMI-CYLINDRICAL DIES. For middle length work, these dies prove most economical. They likewise are bolted to the roll shafts between the housings, and can be conveniently changed. Most of the machining on the two halves can be performed simultaneously when mounted on an arbor. When the work is not too long they can be made reversible, mouthed out at both ends of the impressions where the majority of die wear occurs.

FULL CYLINDRICAL DIES. For long work these dies are mounted on the overhanging right-hand ends of the roll shafts. They can be made most economically as rings, with the cut-away portion only sufficient for feeding the blanks. Their width is limited by permissable overhang, so that the number of grooves must be limited. Overhung mounting permits easy change.

With all three types of dies, there is the great advantage of Ajax Patented Wide Adjustment Gearing, which gives as much as 4 inches adjustment between the roll shafts, permitting as many as ten die redressings. It also makes it easy to maintain the impressions in proper lead match.

The self-contained construction permits moving these machines around the shop to work in conjunction with different Presses or Hammers, wherever their service is required

Continuous operation gives highest production when a considerable series of roll passes is required, but stop-motion with air clutch can be furnished when of advantage in feeding and locating the stock accurately into complex die impressions. Write for Bulletin 91-A.

THE AJAX MANUFACTURING COMPANY

EUCLID BRANCH P. O. CLEVELAND 17, OHIO

1105 DEARBORN ST. CHICAGO 5, ILLINOIS

DEWART BUILDING NEW LONDON, CONN.

SKILSAW CUTS DOWN-TIME AND TOOL GRINDS 75% with Stuart's SPEEDKUT

MATERIAL: Stressproof No. 2

MACHINE: Acme Gridley 2" RB-6

SPEED: Spindle speed 443 (116 pos. per hr.) Surface feet 123

FEED: Form Tool .0012 (.499 core drill .0064 feed)

TOOL LIFE: 12 hours between grinds

CUTTING FLUID: 1 part SpeedKut B to 6 parts paraffin oil

COST APPRAISAL: Savings resultant equal 75% less machine down-times; also 75% less tool grindings

NOTE: Machine is now made available to more production within its capacity.

Worm after broaching eight splines on an American vertical pull-down broach.

Hobbing of the worm is performed on a Barber Colman No. 16-16 gear hobbing machine in one pass.

MULTI-PURPOSE CUTTING FLUID SAVES ON MACHINING WORM GEARS

THE FIGURES above speak for themselves. Skilsaw, Inc., noted as being one of the most progressive and cost-conscious manufacturers in the metal-working field, selected Stuart's multi-purpose SpeedKut B for three operations (automatic screw machine, spline broaching, hobbing) on worm gears after placing it in direct competitive tests with other cutting fluids. SpeedKut B is applied straight on the broach while a 6 to 1 dilution is used on the other two operations.

Probably no single element in machining presents as great an opportunity for cost reduction and fuller utilization of the productive time of expensive machine tools as does the cutting fluid used.

Your Stuart Representative's business is COST REDUCTION. Ask him to call and show you how he can help you.

WRITE FOR D. A. Stuart's booklet, "Cutting Fluid Facts" . . . a guide to better machining.

D.A. Stuart Oil Co.
EST 1861 LIMITED

2729 S. Troy St., Chicago 23, Ill.

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quality ground

REAMERS

WIDEST RANGE of STOCK SIZES

FRACTIONAL sizes 1/16" thru 1-1/2" are standard

WIRE GAGE sizes #1 thru #60 are standard

LETTER sizes A thru Z are standard.

24 HOUR DELIVERY ON STANDARD SIZES

- ECONOMY
- PERFORMANCE
- RELIABILITY

L&I

The Reamer Specialists

LAVALLEE & IDE, INC.
CHICOPEE MASS.

THERE'S MORE TO THIS PICTURE

than first meets the eye. You'll find the entire illustration from which this enlargement was made on Page 228.

"Close-ups"

. . . show you what goes on at Allied. Plant photographs, illustrating a wealth of modern equipment in four large factories, could only tell a small part of the story. You have to get *close* to many individual operations—in production, engineering or even clerical departments—to see the true picture of Allied's careful attention to even relatively unimportant details . . . all of which add up to good products and good service.

At Allied every phase of every job is *important*.

ALLIED PRODUCTS CORPORATION
DEPARTMENT 53
12605 BURT ROAD • DETROIT 23, MICHIGAN

HARDENED AND PRECISION GROUND PARTS • STANDARD CAP SCREWS • SPECIAL COLD FORGED PARTS • SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • ALLITE ZINC ALLOY DIES • JIGS • FIXTURES • R-B INTERCHANGEABLE PUNCHES AND DIES

SPEED PRODUCTION WITH MIDLAND WELDING NUTS

U. S. PAT. No. 2034189

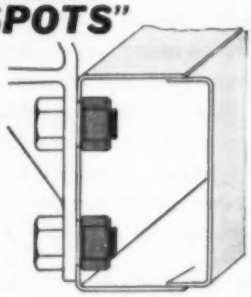
RAPID ASSEMBLY and accuracy are assured by the Midland Welding Nut because it is *self locating*. Collar on nut locates into pierced hole in receiving member. Eliminates use of locating pins or fixtures.

PARTICULARLY USEFUL IN "BLIND SPOTS"

The Midland Welding Nut in concealed and hard-to-reach places, as shown here, speeds up production materially.

Midland Welding Nuts offer numerous other time-saving and cost-saving advantages.

Write, wire or phone us for complete information.



The MIDLAND STEEL PRODUCTS CO.

6660 Mt. Elliott Avenue • Detroit 11, Michigan

WORLD'S LARGEST MANUFACTURERS OF AUTOMOBILE FRAMES—

LITTELL Air Blast Valves

AUTOMATICALLY and INSTANTLY EJECT PIECES FROM PRESS...

Save TIME....	Faster production and lower labor costs.
Save AIR.....	Reduce air consumption 92 percent.
Save DIES.....	No damage to dies due to clogging.
Save HANDS..	Keep operators' hands out of danger zone.

F. J. Littell MACHINE CO.

4109 RAVENSWOOD AVENUE, CHICAGO 13, ILL.

Leading the Field

RUTHMAN GUSHER

MACHINE TOOL COOLANT PUMPS

LEADERS in their field, Ruthman Gusher Coolant Pumps are: economical, low in initial cost, low in maintenance cost, easier to install, use less power when throttled; efficient, give you split-second control of coolant, require no packing and priming; trouble-free, are simply constructed, have dynamically balanced rotating parts for minimum vibration, and heavy-duty, pre-lubricated ball bearings for lower maintenance cost.

WRITE FOR OUR COMPLETE CATALOG

THE RUTHMAN MACHINERY CO.

1818 READING ROAD, CINCINNATI 2, OHIO

More operations per cycle mean LOWER COST PER PART!

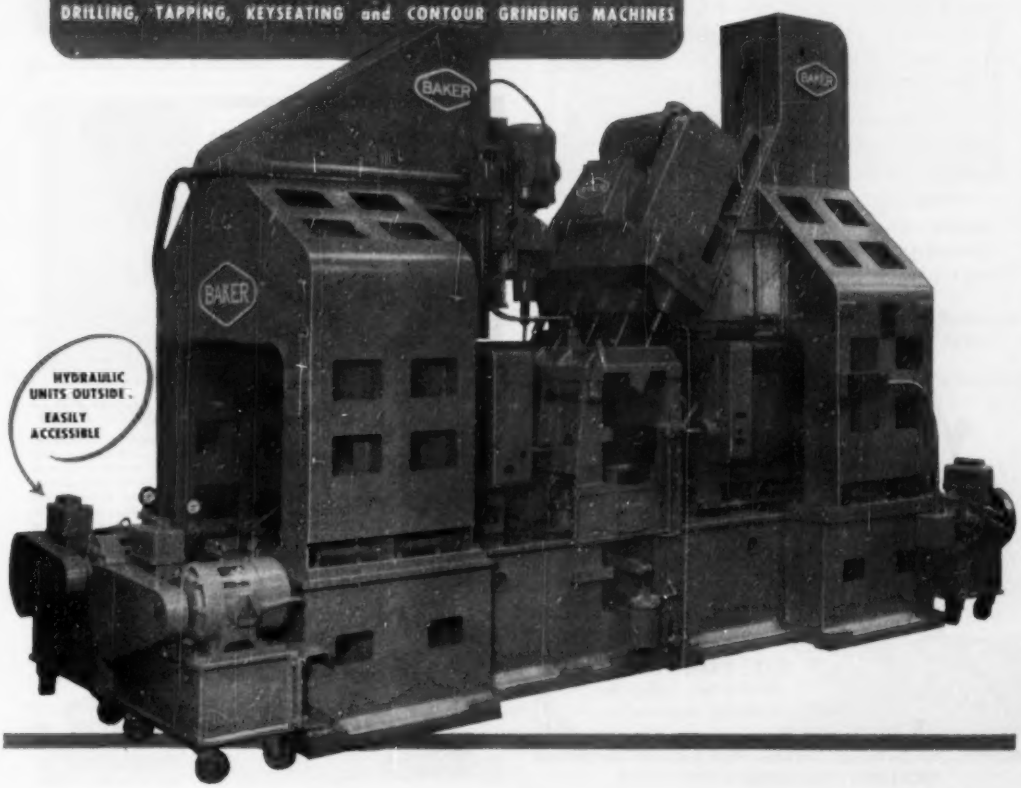
BAKER SPECIAL MACHINES

Baker production machines offer unlimited opportunity for reduction of drilling, boring, reaming, and tapping costs. The new 16 spindle Baker machine illustrated performs 16 individual operations simultaneously on automobile cylinder blocks. Drilling, boring, reaming and countersinking operations are accomplished from vertical, horizontal and angular planes by 4 standard Baker units. The machine is conveyor fed with automatic clamping. Cycle time: 80 parts per hour at 100% efficiency—.75 per piece including loading and unloading time. Consult Baker engineers ... cut your production costs through increased productivity.

SINCE 1867...

BAKER BROTHERS, INC., Toledo, Ohio

DRILLING, TAPPING, KEYSEATING and CONTOUR GRINDING MACHINES



costs more yet saves you money

try a PARCO formulated CLEANER!

A Parco Cleaner costs you more per pound than your present metal cleaner. Yet cleaning economy—actual money savings—is reported from plant after plant, after changing to a Parco *Formulated* Cleaner.

Parco Cleaners are specially formulated to clean and condition metal surfaces for the next step in the finishing operation, to reduce cleaning time, operating temperatures and concentration of cleaner used. Surface area cleaned per pound of cleaner material is the basis of cost comparison of metal cleaning.

Try a Parco *Formulated* Cleaner. See if it doesn't save money for you, too.

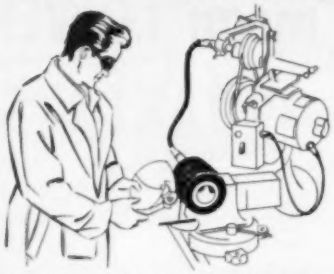
- **Emulsion and Solvent Type**—Spray and immersion cleaners for removing oil, grease and soil from metal surfaces.
- **Acid Type**—Four cleaners for quick, effective removal of rust and scale from iron and steel.
- **Alkaline Type**—Light and heavy duty spray and immersion cleaners. For removal of oil, grease and soil from metal surfaces.

Bonderite, Parco, Parco Lubrite—Reg. U. S. Pat. Off.

Parker RUST PROOF COMPANY
2196 E. Milwaukee Ave.,
Detroit 11, Michigan

BONDERITE—Corrosion Resistant Paint Base • **PARCO COMPOUND**—Rust Resistant
PARCO LUBRITE—Wear Resistant for Friction Surfaces

NEW, IMPROVED **NU-MATIC**



THE WHEEL WITH THE PNEUMATIC DRUM

With this Nu-Matic wheel the abrasive belt rides on a cushion of air contained in a rubber drum. Different pressures in the drum and different grits provide varied surface finishes. Deflate, and belts can be changed easily and quickly for grinding, sanding or polishing. Cut your labor, production and inventory costs with Nu-Matic grinding units. Adapters for ⅜"-11 or ½"-13 power equipment. (Specify size.)

Adaptable to bench, portable or flexible shaft power.

NU-MATIC GRINDERS, INC., 10304 W. McNICHOLS RD.
Detroit 21, Michigan UNiversity 3-2573

A press brake equipped with Wittek No. 6-L Automatic Roll Feed

You Can't Beat WITTEK

Wittek Roll Feeds are made in standard models to meet every requirement in the automatic feeding of strip stock to punch presses or press brakes. The distinguishing feature is their simple and economical method of operation which does away with complicated parts thereby assuring *speed* and *accuracy* in the feeding of various kinds and thicknesses of material.

Wittek Adjustable Reel Stands are designed as companion units to Wittek Automatic Roll Feeds and are available in seven different models to handle *ALL* types of coiled strip stock and wire being fed to punch presses or similar production machinery.

Write for complete descriptive literature.

WITTEK Manufacturing Co.
4320 West 24th Place
Chicago 23, Ill.

Automatic ROLL FEEDS AND REEL STANDS

Announcing the entirely new HYSTER 20

better in every way...

- **NEW** improved Wisconsin *Air Cooled Engine.* Efficient in *any temperature,* high or low. Greater H.P. than other 2000 pound trucks. Power to spare yet *cheaper to run.*
- **NEW,** long life, heavy duty Borg & Beck *Clutch.* Smooth as your automobile clutch. Estimated life over 2 times greater than other trucks. *It can be replaced in less than two hours.*
- **PNEUMATIC TIRES** — Big diameter, 10-ply rating (6.00x9).
- **SINGLE LEVER CONTROL** — one lever for hoisting, tilting.
- **LOW OVERALL HEIGHT** — truck with 9-foot lift only 78½ inches high. Other lift heights available.
- **EXTREMELY LOW OPERATING COSTS.** Almost 100 *new* mechanical improvements.

...Now on display at Hyster Distributors in all principal cities

HYSTER

HYSTER® COMPANY

THREE FACTORIES

2939-14 N. E. Clackamas, Portland 8, Ore.
1839-14 North Adams Peoria 1, Illinois
1039-14 Meyers Street Danville, Illinois

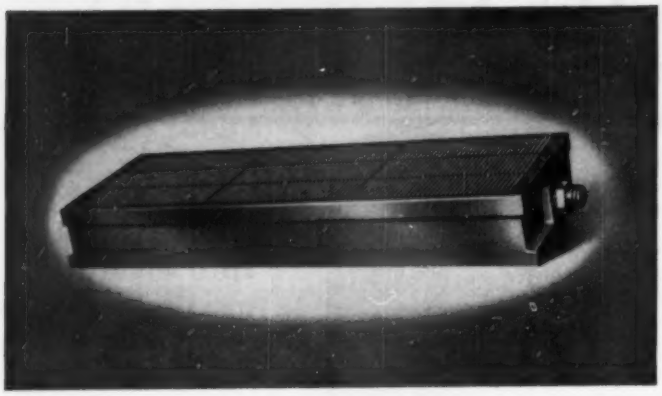
the first completely modern 2000 pound Lift Truck

Designed by Materials Handling Engineers. Priced right, low maintenance costs, standardized repair procedures, low depreciation.

Operates equally as well inside or outside your plant. Low center of gravity, better visibility; EASIER ON FLOOR SURFACES, THE OPERATOR, AND ON LOADS.

THOUSANDS of HYSTER 20 trucks are in use in HUNDREDS of INDUSTRIES. NOW the New Hyster 20 Lift Truck can cut materials handling costs even more. SEE IT at your nearest HYSTER DISTRIBUTOR. While you are there, inspect his SERVICE facilities.

And Now—Walker Chucks Hold Non-Ferrous Metals



Now you can hold brass, copper, aluminum, glass. The new Walker Vacuum Chuck has proven its acceptance. This development is Walker's response to the requirement of the airplane, glass and other industries using other than magnetic materials.

For fast service to meet your own requirements, Walker Engineers are ready for your call. Telephone Worcester 6-6293.

The Original Designers and Builders of Magnetic Chucks

Hold Everything! with Walker Chucks

O. S. WALKER CO. Inc.

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Original Designers and Builders of Magnetic Chucks

PUNCHES and DIES

STOCK SHAPES

ROUND

SQUARE

FLAT

REGULAR OVAL

SEMI-CIRCULAR END OVAL

For All Makes of Power, Hand and Foot Presses

Carried in New York stock for immediate shipment

Metal-working Punch and Die Specialists for sixty years.

Send for circulars covering our line.

T. H. LEWTHWAITE MACHINE CO., INC.

313 East 47th St., New York 17, N. Y.

FLEXLOC

ONE-PIECE SELF-LOCKING NUTS

The FLEXLOC is one-piece, all-metal . . . has ample tensile and long life. It is a Stop and Lock-Nut that can be reused many times. Its "chuck-like", resilient locking segments lock the FLEXLOC securely in any position on a threaded member. It positively "won't shake loose", yet can be removed easily with a wrench.

Write for Catalog 619, it's full of Information.

STANDARD PRESSED STEEL CO.

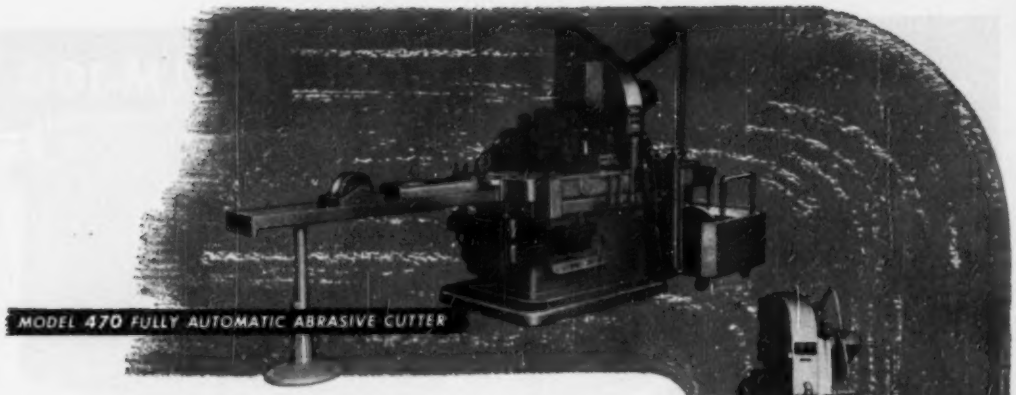
JENKINTOWN 1, PA.

From The *American Machinist* Library of *Tips for Top Shop Men*

YOU can step up interest in company headaches by skits in which employees do the acting. Shop problems can be dramatized with topics selected by the players. Not only does the message go over better but the actors are happier on their jobs.

BEWARE of being too frank. If you always call a spade a spade, it's difficult to avoid giving somebody a dirty dig.

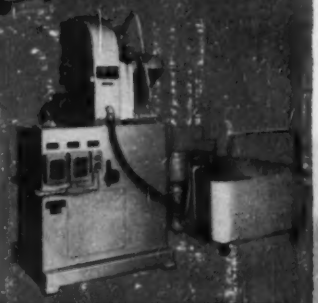
DON'T have too much respect for the man who takes his time, because he's taking your time too.



MODEL 470 FULLY AUTOMATIC ABRASIVE CUTTER

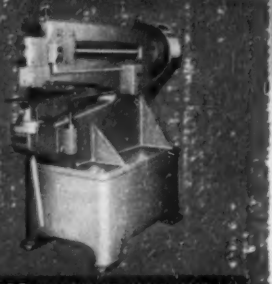
Send for information on the New line of

CAMPBELL *ABRASIVE* CUTTERS



MODEL 223 ABRASIVE CUTTER

MODEL 15 ABRASIVE CUTTER



MODEL 530 NIBBLING MACHINE

We have re-designed our complete line of abrasive cut-off machines for even greater efficiency. For example, the new MODEL 15 low cost machine—the new MODEL 223, hand-operated machine with many automatic features—the new MODEL 406, large capacity machine—the new MODEL 470, fully automatic machine.

Tell us your Cutting requirements . . .

We will send you complete information on recommended model

ACCO

TRADE MARK

CAMPBELL MACHINE DIVISION

AMERICAN CHAIN & CABLE

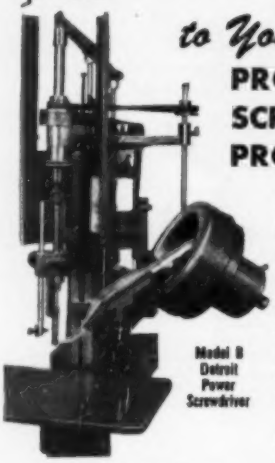
923 Connecticut Ave., Bridgeport 2, Conn.

CAMPBELL
Abrasive Cutters and Nibbling Machines

THIS NEW CATALOG-

has all the Answers-

to Your PRODUCTION SCREWDRIVING PROBLEMS



Model B Detroit Power Screwdriver

It's alive with illustrations and descriptions of invaluable time-saving aids: **POWER SCREWDRIVERS** that drive all types of screws as fast as one a second, without stripping of threads or marring of heads, all driven to uniform tension, 3 models . . . **Also Fixtures, Nut Drivers, Hopper Units and Special Assembly Machines.** Modern necessities that will materially cut production costs.

MOTORIZED HOPPER UNITS

Sturdy efficient machines, easily adapted to Presses, Centerless Grinders, Thread Rolling and Slotting Machines or Special Machines. They will feed Screws, Screw Blanks, Rivets, Pins, Discs, Nuts, Bearing Rollers, Steel Balls, Washers and miscellaneous items. 6 sizes: 8", 10", 12", 16", 24" and 30" diameters.

Mail Coupon for Catalog

DETROIT POWER SCREWDRIVER CO.
2797 West Fort St., Detroit 16, Michigan

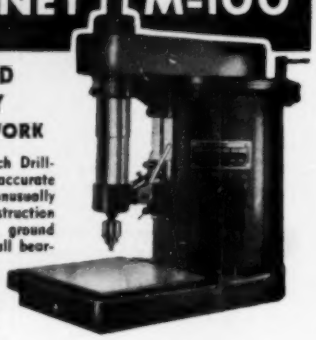
Yes, send along your new catalog . . . sounds interesting.

COMPANY NAME _____

STREET ADDRESS _____

CITY _____ STATE _____

SIGOURNEY M-100



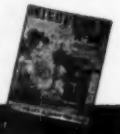
MAINTAINED ACCURACY IN PRECISION WORK

The Sigourney M-100 Bench Drilling Machine is extremely accurate on precision jobs. It is unusually sturdy and rigid in construction . . . has hardened and ground spindles . . . and sealed ball bearings throughout. All moving parts are entirely closed for maximum operator safety. M-100 is built for long and steady service.

This sturdily constructed bench drilling machine is available in 1, 2, 3, and 4 spindle models . . . speeds from 4,000 to 10,000 r.p.m.

Send for illustrated bulletin

THE SIGOURNEY TOOL CO.
Hartford 6, Conn.



Sole Sales Agents

PRATT & WHITNEY
Division Niles-Bement-Pond Co. West Hartford, Connecticut

KEYSEATING
The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

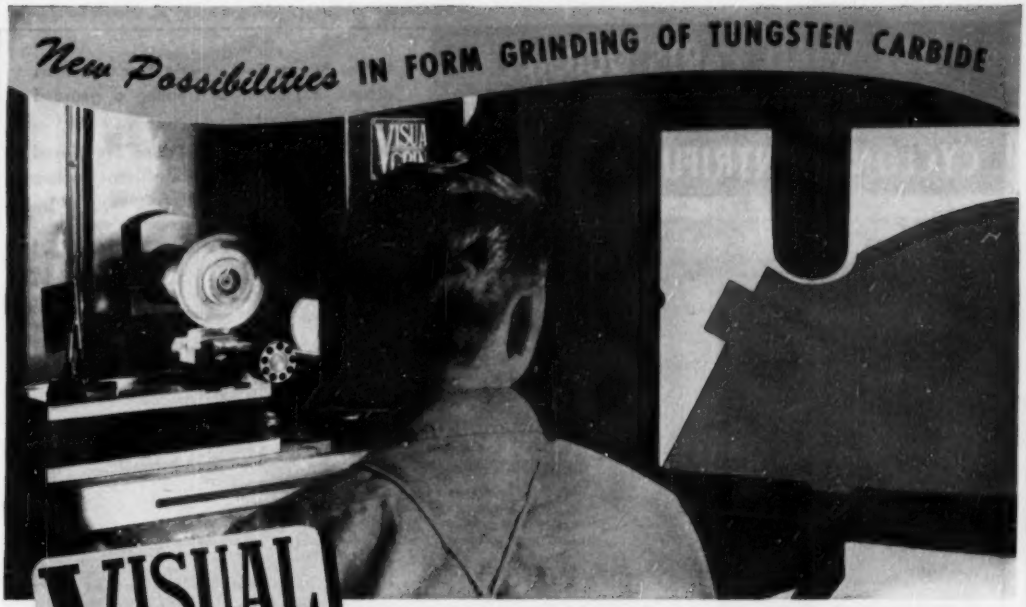
Machines are made in three sizes for keyways 1/16" to 1" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY
403 EXCHANGE ST. ROCHESTER, N. Y.

New Possibilities IN FORM GRINDING OF TUNGSTEN CARBIDE



VISUAL GRIND

TRADE MARK

Combines 3 IMPORTANT CONTOUR GRINDING TECHNIQUES . . . .

New, but thoroughly proven, Visual-Grind greatly increases the scope of form grinding by offering you in one machine the advantages of three grinding techniques. (1) *Image grinding,* which uses our exclusive Reflecto-Image method, the image "bouncing back" from the work-piece. Ideal for work-pieces whose front area is smaller than the rear. (2) *Profile grinding,* which employs an auxiliary mirror, providing a dark-on-light image on the screen. (3) *Templet grinding,* which easily grinds work-pieces too large for screen magnification. The metal is simply ground down to the templet . . . Visual-Grind excels for hitherto difficult tungsten carbide jobs. Find out exactly how Visual-Grind gives greater accuracy, decreases the hazard of error and cuts your costs.

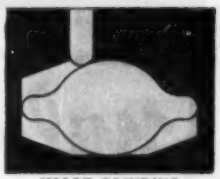
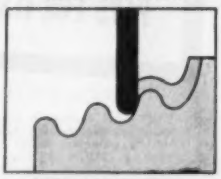


IMAGE GRINDING



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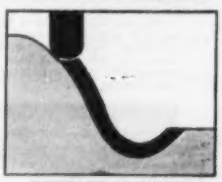


Ttemplet GRINDING

Ask for well illustrated Bulletin A-7

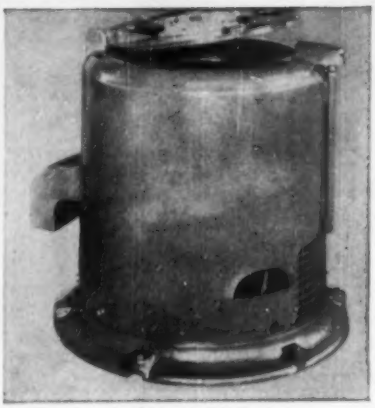
VISUAL GRIND

THE CLEVELAND GRINDING MACHINE COMPANY

6514 ST. CLAIR AVENUE • CLEVELAND 3, OHIO

New Possibilities in Optical Grinding

DRY SMALL PARTS QUICKLY and ECONOMICALLY with BARRETT CYCLONE CENTRIFUGAL DRYERS



The Barrett Centrifugal Dryer — efficient, self-contained, and compact is built in several sizes.

● The Barrett Parts Drying Process centers around a method of creating a guarded cyclone.

In operation, parts to be dried are placed in a well ventilated motor driven rotating basket. Free liquid is immediately thrown off by centrifugal force and any moisture remaining on parts is absorbed in the shortest possible time by the large volume of expanded air continually forced over and through the contents. Provision is made for heating and expanding, also boosting the flow of incoming air to assure faster absorption of moisture. With the large exhauster provided, heated air is not always required.

Direction of basket rotation can be quickly reversed which will change position of the load and accelerate drying. Baskets are available in shapes which experience has shown to be most effective for handling various classes of work.

It will pay to investigate the advantages offered by Barrett Centrifugal Dryers on your work.

Full Details of the Barrett Cyclone Dryer Sent Promptly on Request.

THE LEON J. BARRETT COMPANY. 1800 Grafton Road, **WORCESTER. MASS.**

Designers and Builders of Centrifugal Machinery

Milmaster

PAYS FOR ITSELF IN A FEW DAYS!

YOU CAN convert a horizontal or vertical milling machine into a universal miller . . . with a MILMASTER. This rugged, precision tool *doubles* your machine capacity . . . slashes set-up time by as much as two-thirds.

MILMASTER is built by one of New England's oldest metal working specialists and is bringing completely new efficiency and economy in service the country over.

MAIL COUPON NOW FOR FULL INFORMATION

MILMASTER for horizontal and vertical milling machines.

BEMIS & CALL COMPANY, 205 Main St., Springfield, Mass.
I am interested in more machine capacity. Please send me full details on the MILMASTER.

Name_____

Company_____

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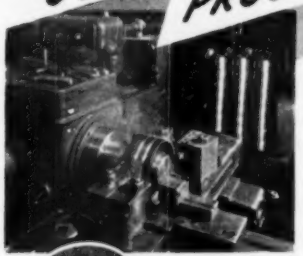
BIG MOTOR MANUFACTURER JUMPS PRODUCTION using ERICKSON *Precision Expanding Mandrel*



Using special Erickson face plate mandrel, drawbar type, with locators and positive drive pins, manufacturer turns outside diameter of motor stators and straddle faces; jumps production to 200 pieces per hour; preserves concentricity within very narrow tolerances. You'll probably be amazed at the almost countless applications to which Erickson Precision Expanding Mandrels can be adapted. Uniform vise-like grip throughout expansion range of ½", guaranteed accuracy of .0005".

Ask for Catalog "A-2" or Erickson Engineer

ERICKSON TOOLS

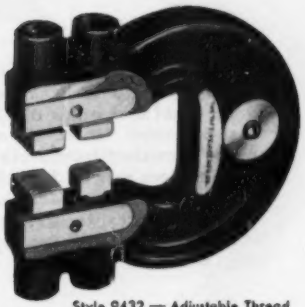
Division of Erickson Steel Co.

2302-D Hamilton Ave., Cleveland 14, Ohio

TAFT-PEIRCE
WOON. R.I. U.S.A.

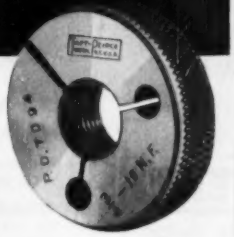
THIS MARK
Means Super-smooth
Longer-life
GAGES

Style 9033 — Plain Adjustable Snap Gage



Style 9432 — Adjustable Thread Snap Gage

Style 9324 — Flange-type External Ring Gage



Style 9424 — Thread Ring Gage

Style 9310 — Double-end Plain Cylindrical Plug Gage

Style 9410 — Double-end Thread Plug Gage, Reversible Construction

Send $1.00
for this Slide Calculator

Here's a truly helpful pocket tool . . . a fast, handy source for hundreds of plug and ring thread gage dimensions under the new Unified and American Screw Thread Standards. Write for it today.

There's a reason why it pays you to buy gages with the Taft-Peirce trade mark. First, they are made with the accumulated skill of one of the world's most experienced gage manufacturers. Second, each gage is carefully ground and lapped to produce an extra-smooth surface. It is this final touch — this extra care in the finishing — that gives the longer wear, the consistent precision, which you want. Write today for price list.

The **TAFT-PEIRCE** Manufacturing Co.
WOONSOCKET, RHODE ISLAND

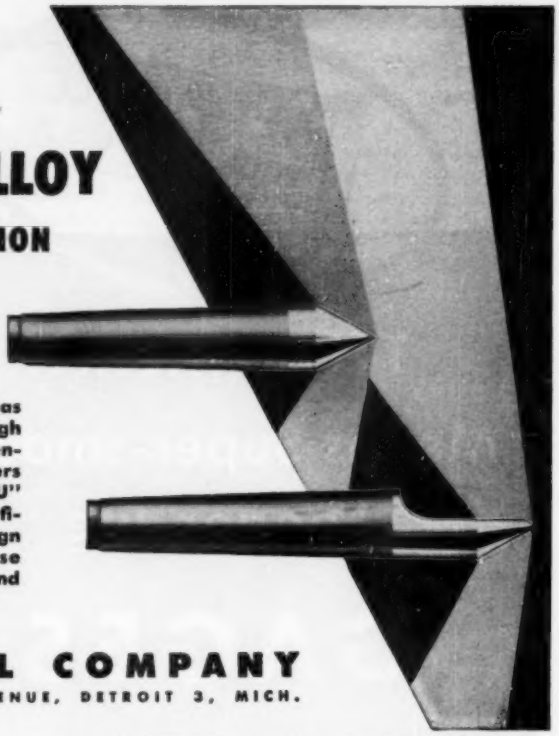
T-P means TOP PRECISION

For really *tough* going—

GORHAM M-40-U ALLOY

RESISTS WEAR AND ABRASION

3 to 10 times longer!



So superior is this alloy that *by actual test* it has shown results 3 to 10 times better than high speed steel and other alloy materials for centers. Standard "M-40-U" alloy tipped centers can be furnished from stock. Special "M-40-U" alloy centers can be furnished to your specifications, or our engineers will help you design special centers to fit your needs. Choose GORHAM "M-40-U" for top performance and long wear.

GORHAM TOOL COMPANY

14400 WOODROW WILSON AVENUE, DETROIT 3, MICH.

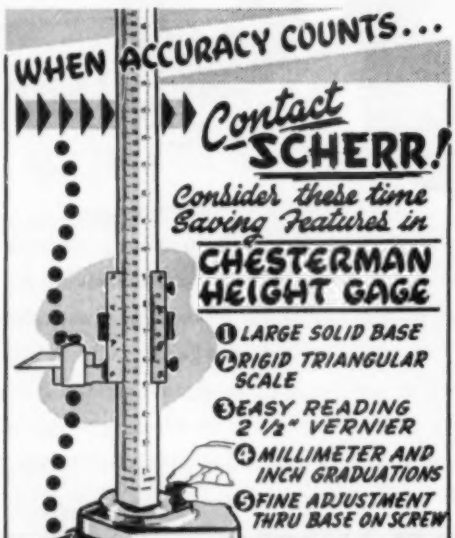
WHEN ACCURACY COUNTS...

Contact SCHERR!

Consider these time Saving Features in

CHESTERMAN HEIGHT GAGE

1. LARGE SOLID BASE
2. RIGID TRIANGULAR SCALE
3. EASY READING 2 ½" VERNIER
4. MILLIMETER AND INCH GRADUATIONS
5. FINE ADJUSTMENT THRU BASE ON SCREW



AVAILABLE IN 12 • 18 • 24 • 40 & 48"

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GEORGE SCHERR CO., INC.

COMPLETE LINE OF PRECISION INSTRUMENTS

200D LAFAYETTE ST. • NEW YORK 12, N.Y.

OUR BUSINESS HAS BEEN BUILT ON SELLING FINE CHUCKS FOR LESS MONEY!

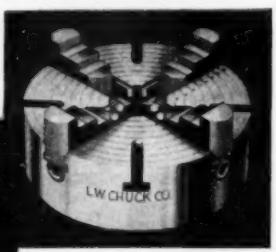
Stretch your chuck dollars with the

L-W 5" UNIVERSAL 3-JAW LATHE AND SCREW MACHINE CHUCK

An Unbeatable Value At Only $25.30

RUGGED • ACCURATE

Fits any lathe having 1½"-8 thread spindle. Using back adapter plate, it mounts on any size or type.



Fits L-W 6½" SD Dividing Head. 3 tough hardened steel pinions. Two sets of accurately cut hardened and ground steel reversible jaws. Cast semi-steel body ground to fine finish.

		Wt.	Jaw Width
5"	$25.30	9 lbs.	½"
6½"	$35.20	18 lbs.	¾"
7½"	$44.25	25 lbs.	¾"
10½"	$92.60	70 lbs.	1"

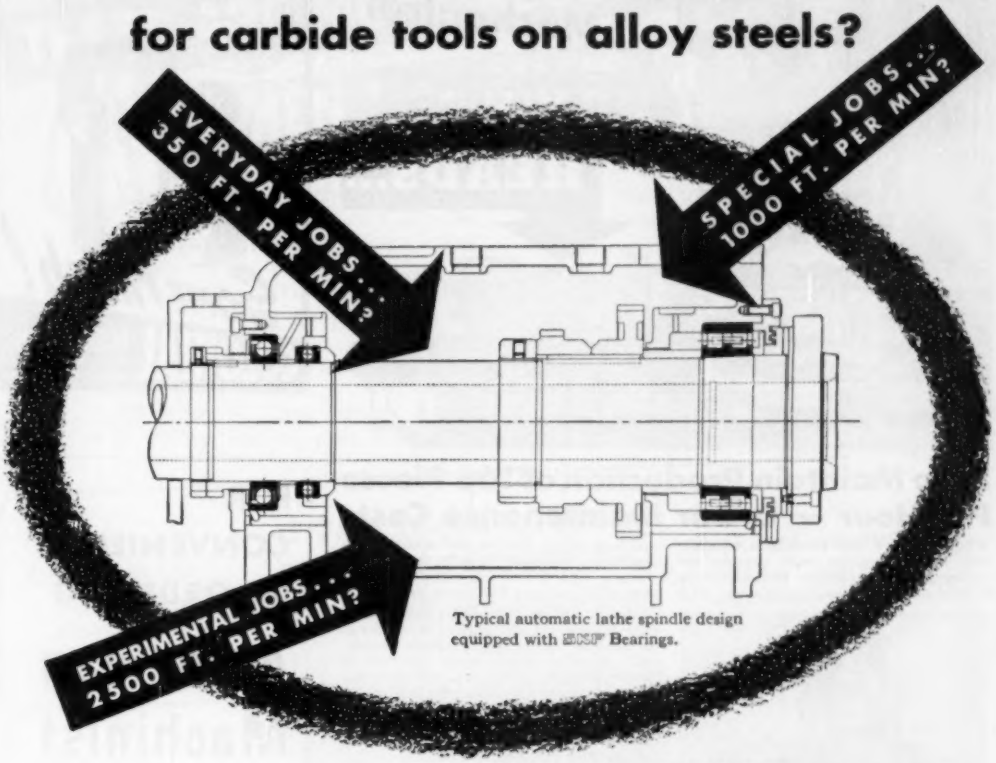
L-W 4-JAW CONVENTIONAL TYPE HEAVY DUTY INDEPENDENT LATHE CHUCKS

		Wt.	Jaw Width
6"	$ 18.30	11½ lbs.	⅝"
8"	$ 22.95	20 lbs.	¾"
10"	$ 30.20	55 lbs.	1¼"
12"	$ 57.35	75 lbs.	1¼"
14"	$ 66.65	91 lbs.	1¼"
16"	$ 87.65	140 lbs.	1½"
18"	$115.55	160 lbs.	1½"

L-W CHUCK COMPANY 2550 ST. CLAIR ST. TOLEDO 1, OHIO

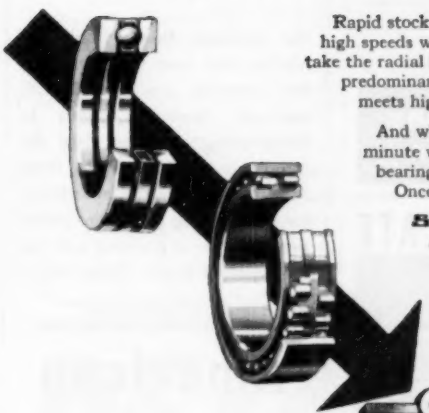
What's the SPEED LIMIT

for carbide tools on alloy steels?



Typical automatic lathe spindle design equipped with SKF Bearings.

Here's SKF's answer!



Rapid stock removal demands utmost spindle rigidity *plus* spindle ability to run at high speeds without excessive operating temperatures or need for adjustment. To take the radial load, SKF supplies Double Row Cylindrical Roller Bearings . . . the predominant thrust load is handled by Ball Thrust Bearings. This combination meets high speed requirements *better than any other spindle bearing design.*

And when experimental operations call for cutting speeds up to 2500 ft. per minute with carbide tools, a similar bearing arrangement with the ball thrust bearing replaced by an angular contact ball bearing meets the challenge. Once again, SKF puts the right bearing in the right place.

SKF INDUSTRIES, INC., PHILADELPHIA 32, PENNSYLVANIA — *the Pioneers of the Deep Groove Ball Bearing—Spherical Roller Bearing—Self-Aligning Ball Bearing.* 7141

SKF

BALL AND ROLLER BEARINGS

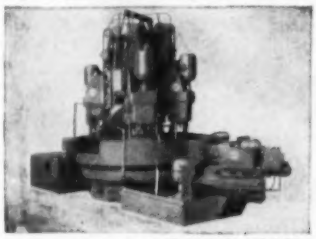
8 REASONS WHY SKF IS PREFERRED BY ALL INDUSTRY

Integrity — Craftsmanship — Metallurgy — Tolerance Control — Surface Finish — Product Uniformity — Engineering Service — Field Service

NEW! Mechanical POWER HEADS...

Help Maintain Production of 166 Pieces Per Hour — Lower Maintenance Costs

When you need high production with low unit and maintenance costs, consider the advantages of Roto-Matics. In this case the Roto-Matic is a station-type machine with indexing table. Drilling and reaming both suspension and king pin holes in front suspension support arms are performed at the rate of 83 pairs or 166 pieces per hour



General view of drilling and reaming machine equipped with new Roto-Matic mechanical power heads.

An outstanding new Davis and Thompson development incorporated in the design of this machine are the Roto-Matic mechanical, electrical power heads operated by screw feeds. Included among the safety features are overload release clutches on the feed screws. Six heads are used, three vertical and three horizontal. Lower maintenance costs are obtained through elimination of excessive servicing.

Machines similar to this can be designed to handle dissimilar operations in the same parts or one operation on continuous production. Investigate the profitable applications of Roto-Matics.

FREE DATA will be furnished upon request. Write today. Ask for bulletin AM-1

DAVIS and THOMPSON Roto-Matic

Davis & Thompson Company

6411 W. BURNHAM ST., MILWAUKEE 14, WISCONSIN

BOSTON UNIVERSAL ANGLE PLATE

A Precision Tool that Holds Work at Any Desired Angle.

Into Angular Drilling, Milling, Planing, Shaping, Grinding

Horizontal motion is 360 degrees; vertical motion, 120 degrees. Fitted with vernier scale reading to 5 minutes.

With a Boston Universal Angle Plate on the job, work is quickly set up on the table and but a few seconds are required to locate it at the desired angle. Indispensable in tool rooms and extremely useful in production runs, the Boston Universal pays for itself many times over by eliminating the necessity of expensive jigs and fixtures.

Made in several stock sizes. Write today for full information.

US AUTOMATIC BOX MACHINERY CO., INC.

40 ARBORETUM ROAD · BOSTON 31, MASSACHUSETTS

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Our *American Machinist* editorial reprint order form lists more than fifty currently available Special *American Machinist* Reports to Metalworking published since the war. If you would like a list of these Special Reports written specifically for metalworking production executives, send us a postcard and ask for "Editorial Reprint Order Form."

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American Machinist

McGraw-Hill Building

New York 18, N. Y.

TESTS ARE MORE ACCURATE WHEN THE OIL IS CENTRIFUGED

Test oils, like many other kinds of factory oils, can profitably be purified by centrifugal force. For example, when a machine tool or its component parts are tested, the test oil is likely to pick up core sand or other solids which must promptly be removed. Moreover, the oil is apt to become "wet" from condensate in the storage tank, and before the oil can safely be re-used this moisture, too, must be eliminated.

Only when test oils are maintained ***clean*** and ***dry*** can tests be completely safe, uniform and reliable. The De Laval Oil Purifier is the most foolproof method for keeping test oils in shape, for the centrifugal action removes ***both*** contaminants—dirt and water.

IT PAYS TO CENTRIFUGE ALL OF THESE FACTORY OILS

Quenching Oil
Increases oil life. Eliminates "soft spots" due to moisture.

Slushing Compound
Enables rust-preventing compound to give full protection.

Cutting Oil
Oil can be re-used safely indefinitely. Less dermatitis. Increases tool life.

Test Oils
Tests are more reliable. Oil can be re-used indefinitely with perfect safety.

Hydraulic Oil
Eliminates rusting. Saves pumps and control mechanisms. Minimizes valve sticking. Prevents hardening of seals.

Miscellaneous Oils
Honing, shock absorber, washing oils are among the many that benefit from being centrifuged.

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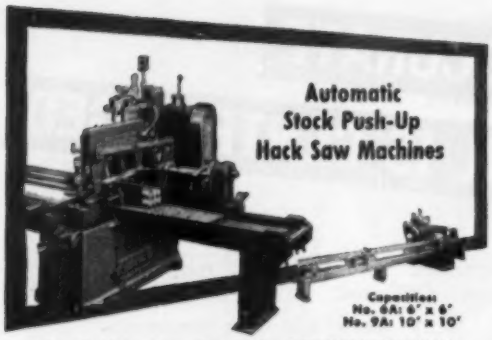
PURIFIERS AND CLARIFIERS FOR FACTORY OILS



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These automatic stock push-up hack saw machines are not new. MARVEL built the first practical bar feed hack saw machines, over 30 years ago. The sound, proven, basic principle of these machines has never changed—but they have been constantly improved and refined. Today they are still the leaders—the most practical, fastest, most accurate, most productive cutting hack saw machines built. No matter what your cut-off work, let us recommend the MARVEL saw that will give you true economy, speed and accuracy at an attractive price.

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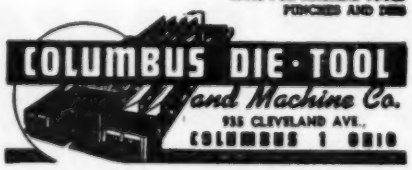

How to make PLANNED assembly savings PAY OFF

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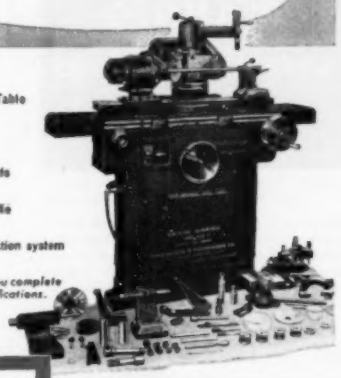

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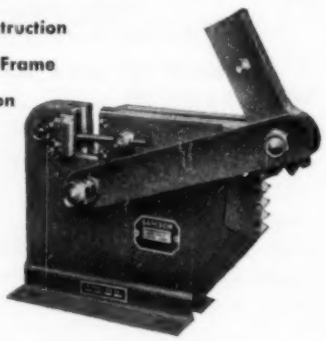

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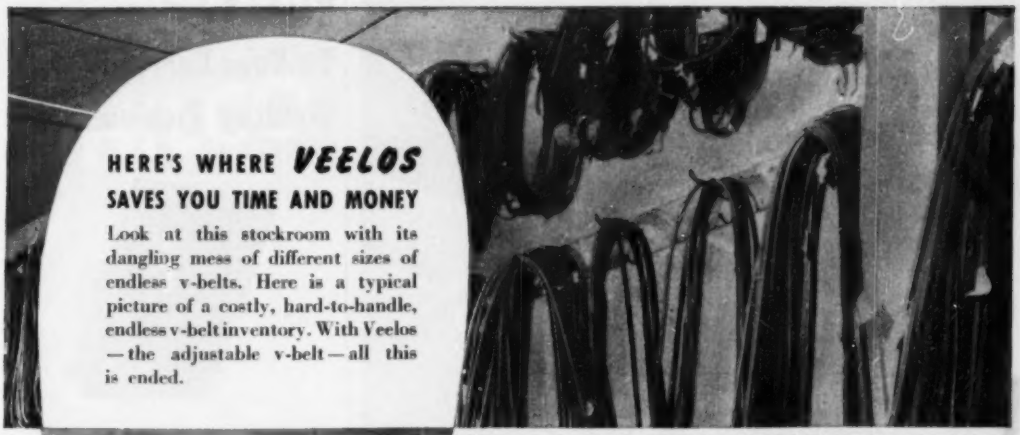

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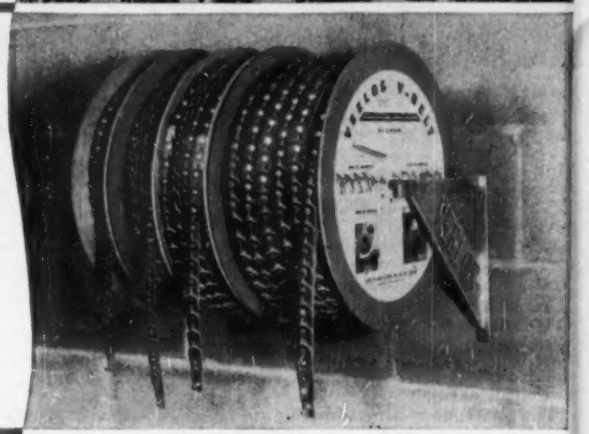

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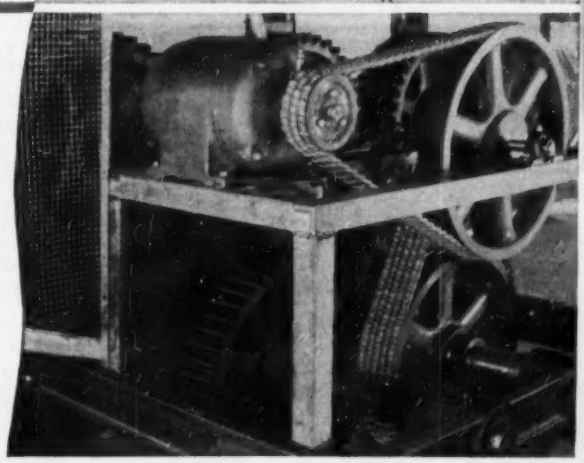

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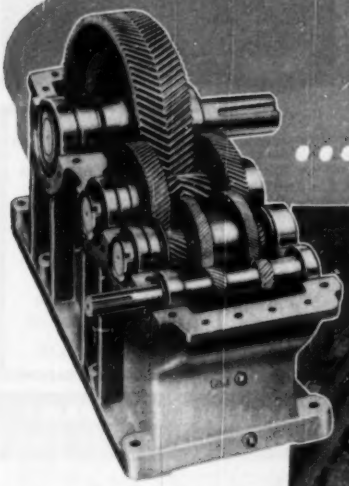

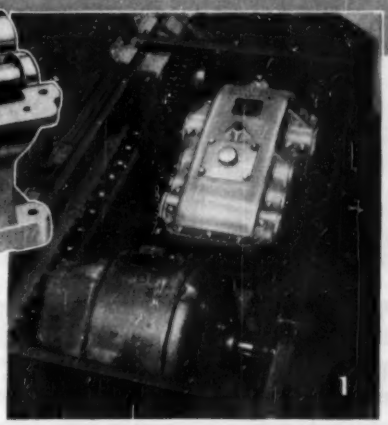

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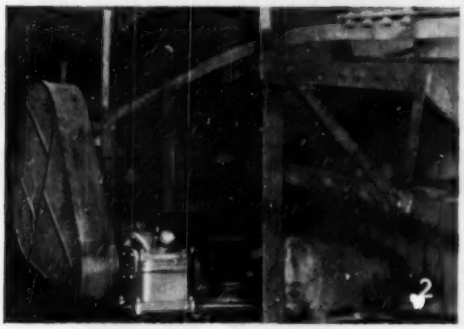

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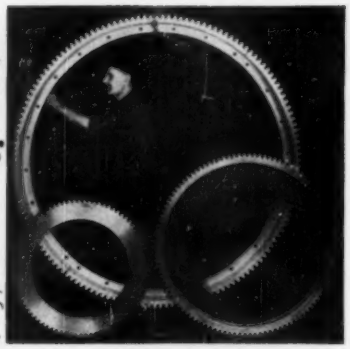

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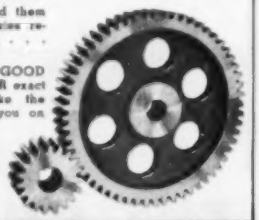

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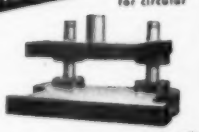

Being originators of Standard Die Sets naturally we are steps ahead in Design—Precision—Dependability and Economy. Because Baumbach Die Sets have demountable Leader Pins and Bushings, Die Set inventory is reduced as well as costly machining time. Learn about Baumbach superiority before you buy.
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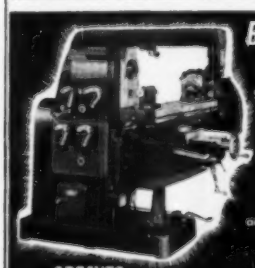

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Simple in design. Easy to operate. Rigid construction including every worthwhile modern feature of milling machine development. With 18 spindle speeds (20 to 1000 R.P.M.) both the universal and plain millers are readily adaptable for heavy duty or light precision production work. Send for bulletin.
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GREAVES No. 2-H MILLING MACHINE PLAIN OR UNIVERSAL
Greaves MACHINE TOOL COMPANY
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SPUR-SPIRAL-WORM-BEVEL GEARS GENERATED WITH PRECISION ON MODERN EQUIPMENT • SEND SAMPLES OR BLUEPRINT FOR QUOTATION!
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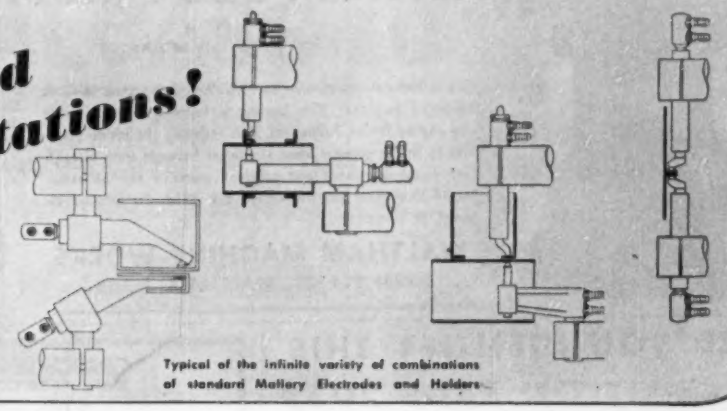

Typical of the infinite variety of combinations of standard Mallory Electrodes and Holders

STANDARD RESISTANCE WELDING ITEMS CARRIED IN STOCK FOR IMMEDIATE SHIPMENT:

Fluted Electrodes
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Single Bend Electrodes
Forged, Irregular Electrodes
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Elkonite* Faced Electrodes
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Off-set Holders
Bench Welder Holders
Paddle Type Holders
Universal Holders
Low Inertia Holders
Close Coupled Holders
Seam Welder Wheels
Seam Welder Shafts and Bushings
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Taper and Thread Adapters
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External Cooling Chambers
Tip Dressers and Files
Water Cooling Hose, Clamps and Connections
Alloy Castings
Alloy Forgings
Projection Butt and Flash Welding Dies

*Reg. U. S. Pat. Off.

Special Materials For Resistance Welding Are "Standard" At Mallory

At first glance, many resistance welding requirements are classified as special . . . and involve the high cost, long deliveries and difficult maintenance normally a part of special items. But many "specials" are standard items in the Mallory line.

This is the result of Mallory's more than 20 years of resistance welding and alloy experience . . . during which time the satisfaction of specific customer requests has accumulated a long list of standard products, now carried in stock for immediate delivery. The solution to your "special" problem with Mallory "standards" will mean immediately measurable savings in costs, delivery time and the need for maintenance . . . a natural combination for greater welding production and economy.

That's value beyond expectations!

Mallory's resistance welding know-how is at your disposal. What Mallory has done for others, can be done for you!

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Resistance Welding Electrodes, Holders, Dies, Rod and Bars, Castings, Forgings

SERVING INDUSTRY WITH

Capacitors
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Power Supplies
Resistance Welding Materials

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MALLORY

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. . . for precision work

Arch Sub-Press

The cylindrical plungers in the Waltham Sub-presses slide in babbitted bearings. This bearing is tapered on the outside and can be forced downwards, thus reducing the inside diameter to fit the plunger when the latter becomes worn through use. Exact alignment and constant precision can be maintained throughout the life of the die. Write for information about the nine sizes.

Overhang Sub-Press

WALTHAM MACHINE WORKS
HIGH STREET, WALTHAM, MASS.

DID YOU IDENTIFY THIS PICTURE ON PAGE 203?

This is a view of some of the wire stocked for cold forging production at Allied Products Corporation. Like all other materials used at Allied, this wire has been carefully selected from top quality sources.

A "close-up" of materials and the many individual operations performed at Allied will prove to you that here *your* work gets competent attention.

"ROCKWELL" HARDNESS TESTER
Made Only by Wilson

● Development and improvement of "ROCKWELL" Hardness Testers over the years have made "ROCKWELL" scales the universal standard of hardness. A reading on the "ROCKWELL," the "ROCKWELL" Superficial or the "TUKON" Tester is the same in any language.

WILSON MECHANICAL INSTRUMENT CO., INC. ACCO
AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE
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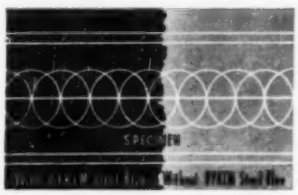
DYKEM STEEL BLUE

STOPS LOSSES making dies & templates



Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2301 B North 11 St., St. Louis, Mo.

CARLTON RADIAL DRILL

"Anti-friction Bearings Throughout"

FEATURES: 1. Low Hung Drive to Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all Speeds. 4. Concentrated and Convenient Push-button Controls. 5. Constructed on Unit Principle.

THE CARLTON MACHINE TOOL COMPANY

CINCINNATI 25, OHIO, U. S. A.

JALCASE 10

J&L STEEL

- - - - - - the top grade of J&L cold finished JALCASE - - - - WITH HIGH MECHANICAL PROPERTIES

. . . and all the high machinability properties of other Jalcase grades

When the shop bull-sessions get started on "better than average" steels, and the boys get down to fine points, you can be sure that Jalcase 10 (AISI No. C-1144) will come up for discussion. That's because Jalcase 10 is the grade of cold-finished Jalcase steel made for those tough and "in between" applications.

Many times finished part specifications call for a high degree of hardness—but not as high a degree as that obtained through heat treating of the finished part. In these applications, manufacturers and machinists have found it profitable to use Jalcase 10 and dispense with heat-treating processes altogether.

Machinists who know their stuff also know that Jalcase 10—the highest carbon grade of Jalcase—has high mechanical properties. They know that Jalcase is the original cold-finished, open-hearth, free-machining steel. They know that Jalcase 10 has over 25 years of research and experience behind every ton produced.

Interested in some technical data? Here are the chemical properties and mechanical properties of Jalcase 10:

CHEMICAL	
Carbon Range	.40-.48
Manganese Range	1.35-1.65
Maximum Phosphorus	.045
Sulphur Range	.24

TYPICAL PHYSICAL PROPERTIES	
Tensile Strength	134,050 lb./sq. in.
Yield Strength	107,840 lb./sq. in.
Elongation in 2 inches	13.5%
Reduction of Area	35.7%
Brinell Hardness	269

If you haven't tried Jalcase 10 yet (many shops have, and like it, too), why not send for our booklet entitled "You Can Make Them Better with Cold-Finished Jalcase." This 16-page illustrated booklet gives you technical information, charts and graphs about Jalcase 10 (and the other nine grades of Jalcase, too) that will help you make better parts.

Write Today!

Jones & Laughlin Steel Corporation
402 Jones & Laughlin Building
Pittsburgh 30, Pennsylvania

☐ Please send me a copy of "You Can Make Them Better with Cold Finished Jalcase."

☐ I am interested in making a trial run on J&L Jalcase 10. Please have a representative call.

Name_____

Title_____

Company_____

Address_____

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JONES & LAUGHLIN STEEL CORPORATION

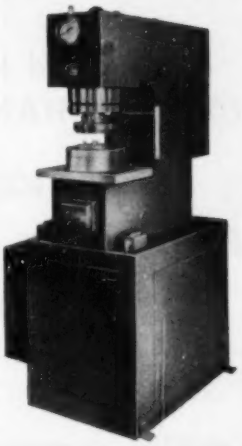
From its own raw materials, J&L manufactures a full line of carbon steel products, as well as certain products in OTISCOLOY *and* JALLOY *(hi-tensile steels).*

PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS

PRODUCTION UP 1500%

M & N SOLVES A PROBLEM ...CLIENT CUTS COSTS

The U. B. Company (name and address on request) was producing 30 buffing wheels an hour — using ordinary hydraulic equipment. Consultation with M & N engineers brought about plans and subsequent building of the M & N "C"-Frame press illustrated. HOURLY PRODUCTION WAS OVER 450 UNITS!



M & N Hydraulic Presses are available from 5 to 75 ton capacity, compactly built and self-contained. Press may be operated manually, by foot, or push button. Double acting cylinder provides power ram return at high speed. This M & N "C"-Frame press features automatic reversal of pressure setting.

M & N Presses are successfully used for drawing, forming, powder metallurgy, silversmithing, punching, stamping, and a wide range of other industrial uses.

WRITE TODAY FOR BULLETIN 102

M & N MACHINE TOOL WORKS, INC.
299 ALLWOOD ROAD CLIFTON, N. J.

BUZZER *Gas Fired* POT FURNACES

UP TO 1650° F. QUICKLY ATTAINABLE. NO BLOWER OR POWER NECESSARY . . . JUST CONNECT TO YOUR GAS SUPPLY.

Atmospheric Pot Hardening Furnace, tangentially fired, assures quick, even heat. Many models available — write for "BUZZER" catalog showing Gas Furnaces, Burners, and other equipment.

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Dial Gauges and Indicators

are accurate, reliable and built to stand the gaff of hard usage.
This Model C Dial Indicator has a 2½ in. diameter dial, with 50 or 100 divisions. Can be furnished in graduations of .001-in., .0005-in. or .01 mm. Has a ½-in. range movable dial easily set at zero.
The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.
There is a R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

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Makers of Dial Gauges Since 1885

STRAIGHT SIDE SINGLE CRANK PRESSES
for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

Full details on request.

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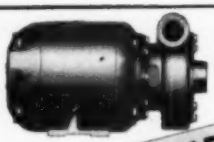

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PIONEER Pumps
HIGH EFFICIENCY • LOW POWER CONSUMPTION
GREATER VOLUME AND LESS MAINTENANCE

400 MODELS TO CHOOSE FROM

PIONEER PUMP & MANUFACTURING CO.
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PRODUCTION MEN —LIKE THESE 4 IN DETROIT— USE SUNNEN HONING ON I. D.'S;

Keep Difficult Jobs on Schedule

- *Eliminates Production Bottlenecks*
- *Produces Precise Dimensional Accuracy*
- *Speeds Assembly*
- *Reduces Rejects*

Many manufacturers in the automobile capital of the world are using Sunnen Honing to solve some of their most difficult internal finishing problems. Where accuracy or finish—or both—are important, Sunnen Honing has proved to be the *economical* method of production.

Sunnen Honing is many times faster than lapping, and far more accurate than grinding . . . produces holes that are straight; round; free from bell-mouth, taper and warpage . . . and gives any surface finish required.

SUNNEN HONING CUTS PRODUCTION TIME • Provides interchangeability of precision parts • Eliminates chucking, fixtures, and set-up time • Removes cross-drill burrs and flash with amazing speed • Rounds up and straightens holes after heat-treating.

Versatile Sunnen Honing Machines are solving production problems for many of America's most prominent manufacturers. And they save time and money on salvage, maintenance, experimental and tool room work. Stationary equipment hones diameters from .120″ to 5.5″—portable equipment range, .185″ to 14.5″. Hones open and blind holes—handles holes with keyways, ports, and lands—any metal, any hardness; as well as ceramics, glass and plastics.

For less than $1500.00 you can have a complete Sunnen Honing installation. On long runs or short, you'll profit from the many advantages. Mail the coupon for details.

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☐ Send Free Bulletin MB-12 (Production Honing)
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"Only Practical Way to Produce Extreme Straightness and Roundness"

E. G. Patzkowsky
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Ultramatic Drive Division
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Throttle Control Valve for Ultramatic Transmission
Material — SAE1117 "C" Carbo-Nitrided Steel
Hardness — Rockwell 65 "C"
Hole Diameter — .500
Length — 3⅛
Tolerance — .0005 for size; .0002″ for taper and out of round
Finish — 32 Micro-inches
Gage — Indicator type
Stock removal — .0005 to .0025
Production — 50 per hour

"True Geometric Accuracy Must Be Held Throughout Length of Part"

John Kostecki, Sr.
Plant Superintendent
Congress Drives Division
Tann Corp.

Sleeve for Automatic Transmission
Material — Aluminum — SAE308 (part has very thin wall)
Hole Diameter — .438
Length — 2⅝
Tolerance — ± .0002
Finish — 16 Micro-inches
Gage — Plug
Stock removal — .002 to .003
Production — 60 operations (30 complete parts) per hour

"Produces Perfectly Straight Round Holes for Perfect Mating of Parts"

Arthur W. Steel
Plant Superintendent
C. M. Smillie & Co.

Selector Valve Sleeve
Material — 440A stainless steel
Hardness — Rockwell 52-55 "C"
Hole Diameter — .6873
Length — 2⅛
Tolerance — + .0002 — .000
Finish — 10 Micro-inches
Gage — Air gage
Stock removal — .001
Production — 15 per hour

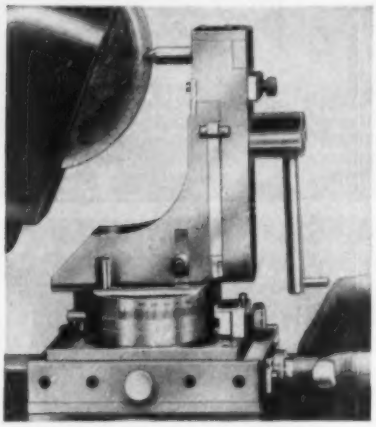
"Quickly Removes Heat Treat Distortion — No Chucking"

Joseph Lohmann
Production Manager
L. M. Gear Co.

Compound Gear
Material — X1335 steel
Hardness — Rockwell 40-45 "C"
Hole Diameter — .251
Length — 1¼
Tolerance — + .001 — .000
Finish — Smooth
Gage — Plug
Stock removal — .0005 to .001
Production — 1 per minute

FASTER FORM-DRESSING

with J & S "Fluidmotion" RADII and ANGLE DRESSERS



MODEL "C" "Fluidmotion" DRESSER

For use in repetitive precision production, where extremely precise depth of radii and simplicity of operation are required. Lead-screw handle graduated to .001"—moves dresser forward, backward with sensitive range of full inch.

"FLUIDMOTION" is the simplest, most accurate method of form-dressing. It allows dressing the entire angle-radius-angle wheel profile on surface and cylindrical grinders in one continuous motion—with one easy setting. A clean, precise form results, with no tool or chatter marks. Angles and curves flow into each other, without sharp changes of direction.

Highly skilled operators and elaborate set-ups are unnecessary. Beginners quickly learn to turn out contours accurate to .0001".

Features: Automatic centering, dustproof and chatterless, high-carbon, high-chrome construction. Dresses wheels up to 20" in diameter—easily adaptable to all surface and cylindrical grinders, with J & S fixtures.

J & S "FORM-MASTER" ANGLE and RADIUS DRESSER —less expensive—dresses both angles and radii.

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47-1 Main Street, East Orange, N. J.
Representatives in Principal Cities

Precision Die Made—Lowest Possible Cost.
DAYTON ROGERS MFG. CO., Minneapolis 7, Minnesota

Famous for
- ACCURACY OF THREADS
- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on Page 90 Feb. 10 '49 American Machinist

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Pacific Coast Representative: A. C. Behringer, 854 N. San Pedro St., Los Angeles California. **Canada:** *F. F. Barber Machinery Co., Toronto, Canada.*

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LUERS Patented Cutting Off Tool Holders, Patented Cutting Off Blades
ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips. MEANS MAXIMUM CUTTING EFFICIENCY
Manufactured by
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Die-Making Machines
They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.
OLIVER ADRIAN PRODUCTS
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STAMPS UP TO 3/8"
DIE WHEEL HOLDS 40 CHARACTERS.
DIE WHEELS ARE INTERCHANGEABLE.
DIES ARE REPLACEABLE.
POWERFUL SCREW PRESSURE MARKS STEEL.

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MODEL 7P

This High Speed Chucking Machine has operation features for accurate turning, boring and threading of large diameter parts at production speeds. Prevailing labor rates make this machine an essential for lower manufacturing costs.

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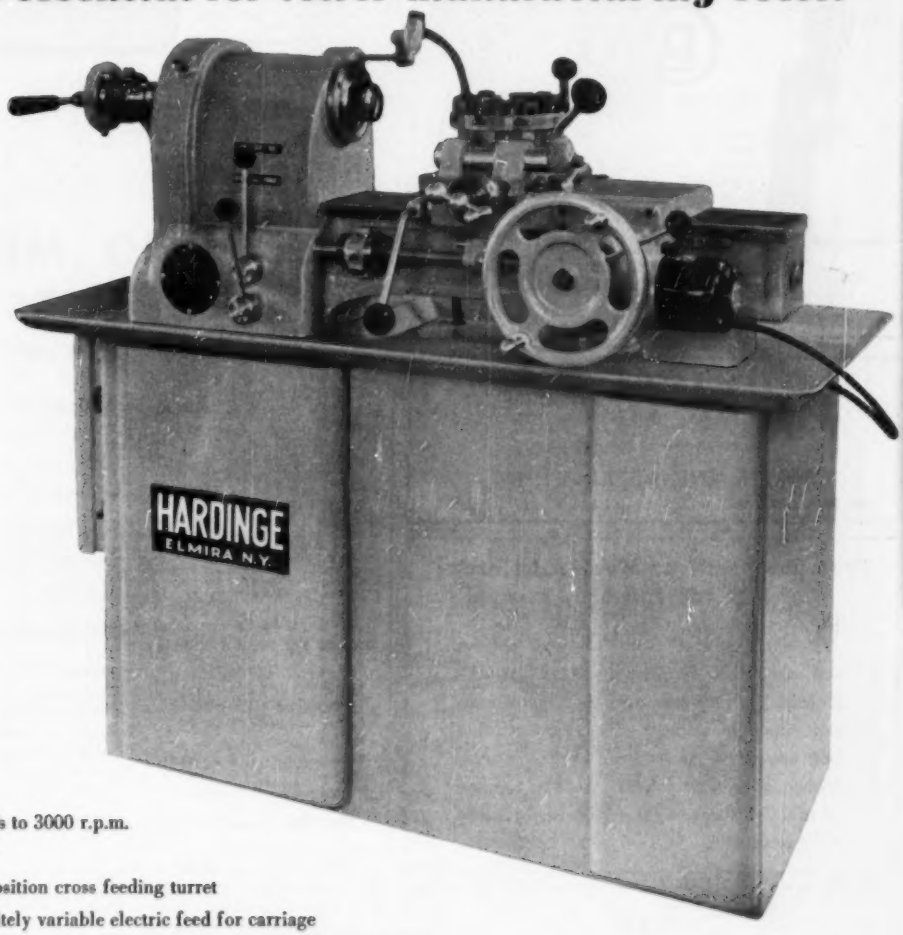
1890 - 1950



Spindle speeds to 3000 r.p.m.
Swing 13"
Eight position cross feeding turret
Infinitely variable electric feed for carriage
Solid one-piece hardened and ground steel bed ways
High speed production threading head

Write to Hardinge *for other particulars.*

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makes precision "milled from the bar" screw machine products that stand up under hard usage . . . and whose uniformity and fine finish save assembly time and maintenance costs.

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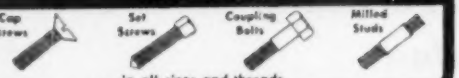

. . . in all sizes and threads.

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RIVETERS — PIONEERS in their line—head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

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THE GRANT MFG. & MACHINE CO.
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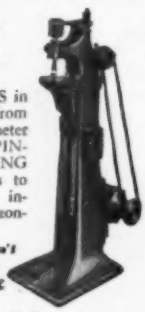

ROLL FEEDS

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Illustrated literature on request

WHYTE ENGINEERING, INC.
185 ROWLAND ST. SPRINGFIELD, MASS.

From the *American Machinist* Library of *Tips for Top Shop Men*

WHEN you face a problem, work out the best solution you can before you "go upstairs" for help. Some top executives like to pontificate, and resent an assistant with an answer, but most appreciate this evidence of your interest. Further, given your solution, the Boss may go on to a better one; without it he may get only as far as you did.

GIVE

TO CONQUER

CANCER

HOW TO GIVE METAL PRODUCTS THE RIGHT FINISH . . .

Here are economical, sales-building methods that produce more attractive products

SUPPLIES UP-TO-DATE INFORMATION ON:

—the techniques involved in metal finishing
—the commercial aspects of metal finishing
—the sales value of attractive finishes
—the economics of metal finishing
—the design of parts which require finishing
—new finishing equipment and processes
—metal finishing costs

HERE'S a manual which demonstrates the vital importance of the finishing process in the final appearance and sales appeal of a product and describes each of these processes in careful detail so that you may achieve an attractive finish as efficiently and economically as modern methods will allow. With special attention to improving results and reducing costs, the book covers all types of finish, such as galvanising, polishing, plating, lacquering, enameling and painting—wood grain reproduction, chromium plating, and synthetic enamels, and many new finishes of a specialized nature.

FINISHING METAL PRODUCTS

By HERBERT R. SIMONDS
Consulting Engineer

and ADOLPH BREGMAN
Consulting Engineer, Executive Secretary, Masters Electro-Plating Association

Second Edition

352 pages, 5¼ x 8¼, 147 figures, $4.00

The revised edition of this highly useful manual describes many new developments, and incorporates the rapid progress in plastics and synthetic resins. Chapters on coloring metal, on costs and estimates and on organic coatings have been added. Answers to every kind of question which arises in connection with the finishing processes are supplied in careful detail, aiming at the most efficient and economical means of achieving a highly attractive finished product with a maximum of selling appeal.

Read this partial list of chapter headings for a few of the important processes and topics described:

- Sales Value of Attractive Finish
- Importance of Color
- How to Minimize Cleaning Expense
- Pickling for a Better Finish
- Polishing in Industry
- Designing Products to Reduce Polishing Expense
- Recent Developments in Plating
- Chromium Plating
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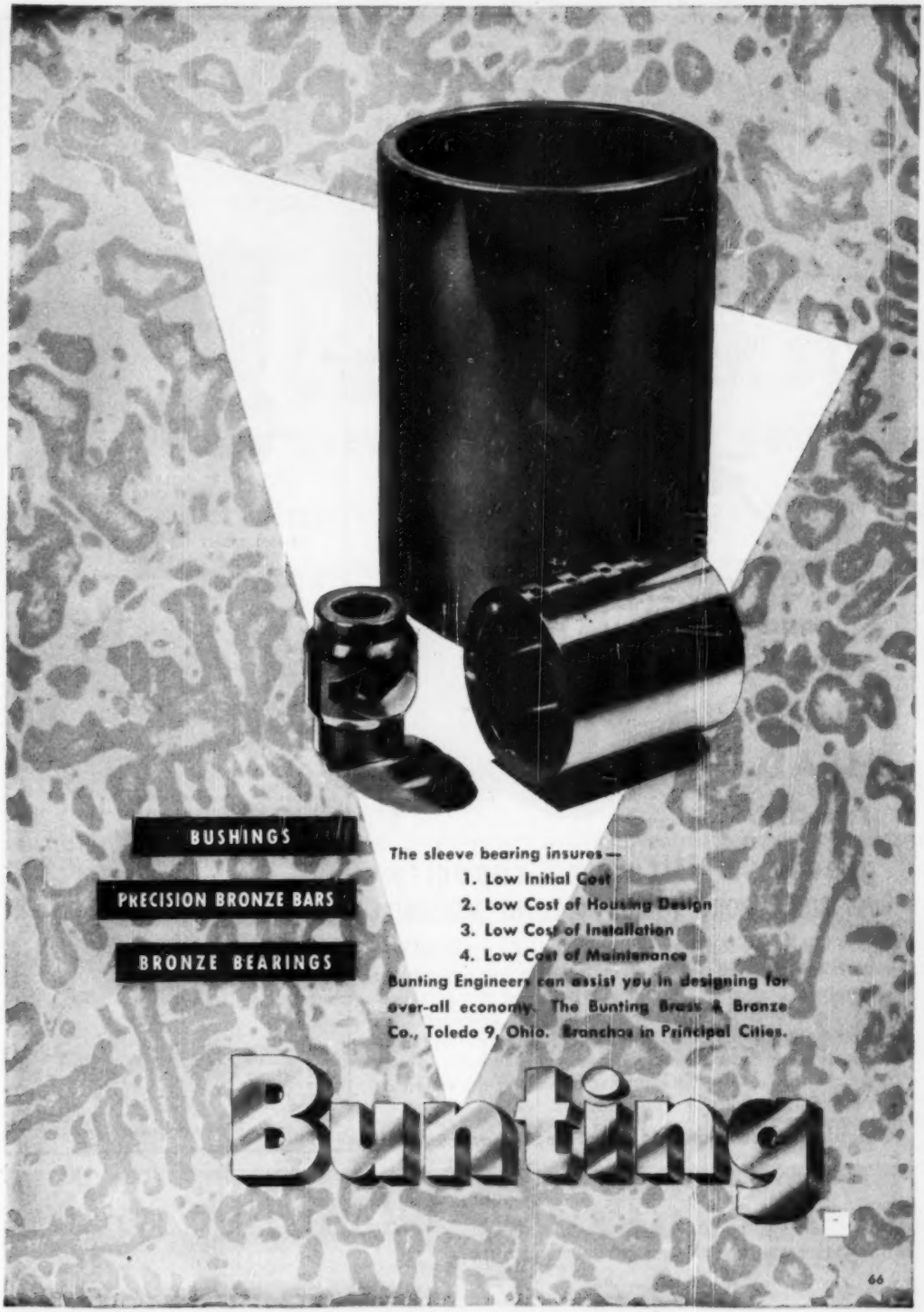
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Bunting
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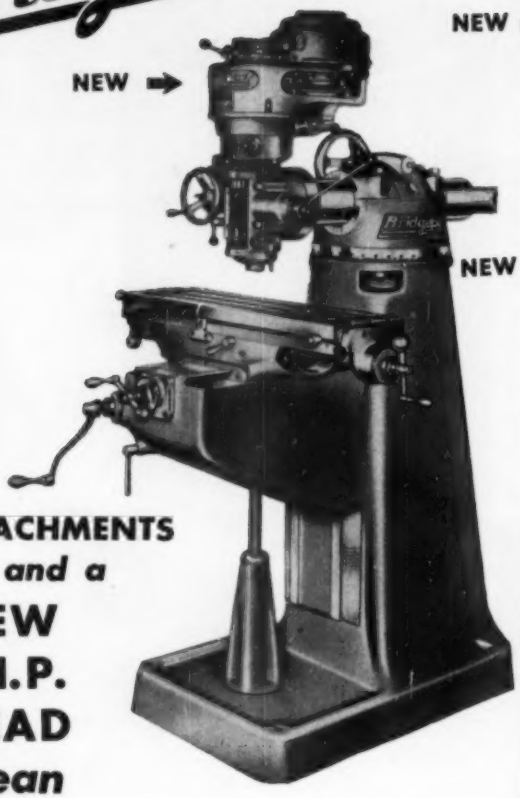
Bridgeport

NEW ➡



ATTACHMENTS *and a* NEW 1 H.P. HEAD *mean*

greater utility and capacity *with* BRIDGEPORT TURRET MILLING MACHINES

Not only has the capacity of this universally accepted machine been increased but also its utility. Many more operations can now be conveniently handled with speed and accuracy. Each new attachment has been specifically developed for use on the Bridgeport Turret Milling Machine. Thus the thousands of machines now in service can be modernized with these new attachments, still further increasing the return on the original investment in "Bridgeports".

Complete details available promptly on request.

MILLING MACHINE VISE

NEW ➡

An improved, streamlined vise with coolant trough. Greater gripping power assured by large diameter screw.

NEW ➡

(Left) **HEAVY DUTY RIGHT ANGLE ATTACHMENT**

Designed for milling and drilling at right angles. Available for both Master and 1 H.P. Milling Heads.

(Right) **LIGHT DUTY RIGHT ANGLE ATTACHMENT**

For milling and drilling narrow, deep molds and cavities.

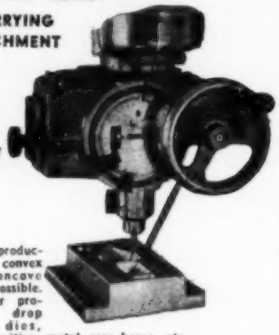
No. 2 BORING HEAD

➡NEW

Fits new 1 H.P. Bridgeport Milling, Drilling and Boring Attachment. Boring Tools and holder furnished make it possible to bore holes up to 6" diameter.

CHERRYING ATTACHMENT

➡NEW

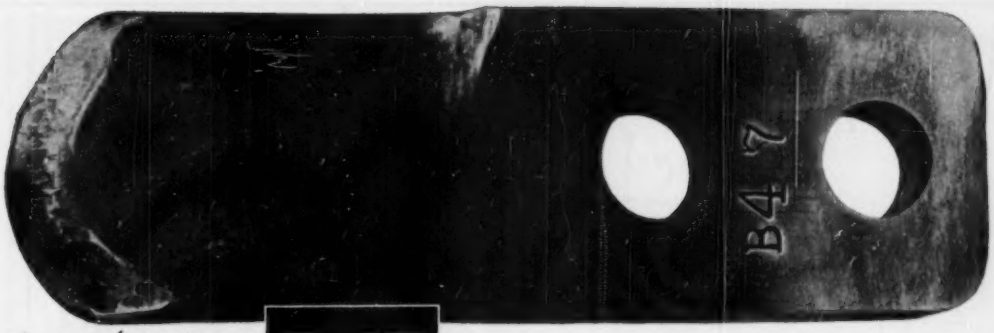


Makes production of convex and concave shapes possible. Ideal for producing drop forge dies, molds, cavities, metal core boxes, etc.

Bridgeport MACHINES, INC.

Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines



This punch gave double service!

B-47 HOT WORK STEEL

gives you more runs for your money

...anywhere from 1½ to 5 times the Performance!

This block had double life!

This die lasted 50% longer!

SOME TYPICAL EXAMPLES

B-47 dummy blocks, vs. 9% and 12% tungsten types, extruded more than twice as many brass and copper tubes. B-47 dies outperformed 12% tungsten type 1½ to 1.

B-47 punches, vs. low-carbon 18-4-1 type, hot pierced more than twice as many eyes in steel axes. See top picture.

B-47 die inserts, vs. 9% tungsten types, hot pressed more than twice as many steel side gear forgings. B-47 die inserts, vs. regular insert material, performed better than 5 to 1.

B-47 dummy blocks, vs. 5% tungsten-5% chromium types, extruded twice as many copper and brass tubes and rods. B-47 dies outperformed 12% tungsten-12% chromium type.

B-47 punches, vs. 5% chromium type, hot extrusion forged 1½ times as many automotive steel front axle spindles.

B-47 die inserts, vs. 9% tungsten types, extruded 1½ times as many high alloy steel automotive valves. This is considered a very difficult job for any grade of hot work steel.

SEND NOW

for "Blue Sheet" on Grade B-47

This four-page folder gives technical data on B-47 for brass extrusion dummy block and dies, valve extrusion die inserts, hot punch tools, forging die inserts, press forging dies, and hot work in general. *Write for your copy today.*

ADDRESS DEPT. AM-7

Looking for a better hot work steel? You'll find it in B-47—an improved chromium, tungsten, cobalt, vanadium type whose superiority is established by actual performance runs such as those summarized above. All tests show that B-47 has unusual resistance to shock and abrasion at elevated temperatures.

Developed originally for applications in the copper and brass industry, B-47 has given excellent results on difficult hot work jobs on steel. B-47, when properly heat treated, exhibits a well rounded combination of red hardness, toughness, and resistance to wear and heat checking that makes it a valuable addition to the Allegheny Ludlum group of hot die steels.

Put B-47 to the test. You'll find that it will do any number of severe hot work jobs without washing out or changing size. Get in touch with A-L, today. Let us help you to use B-47.

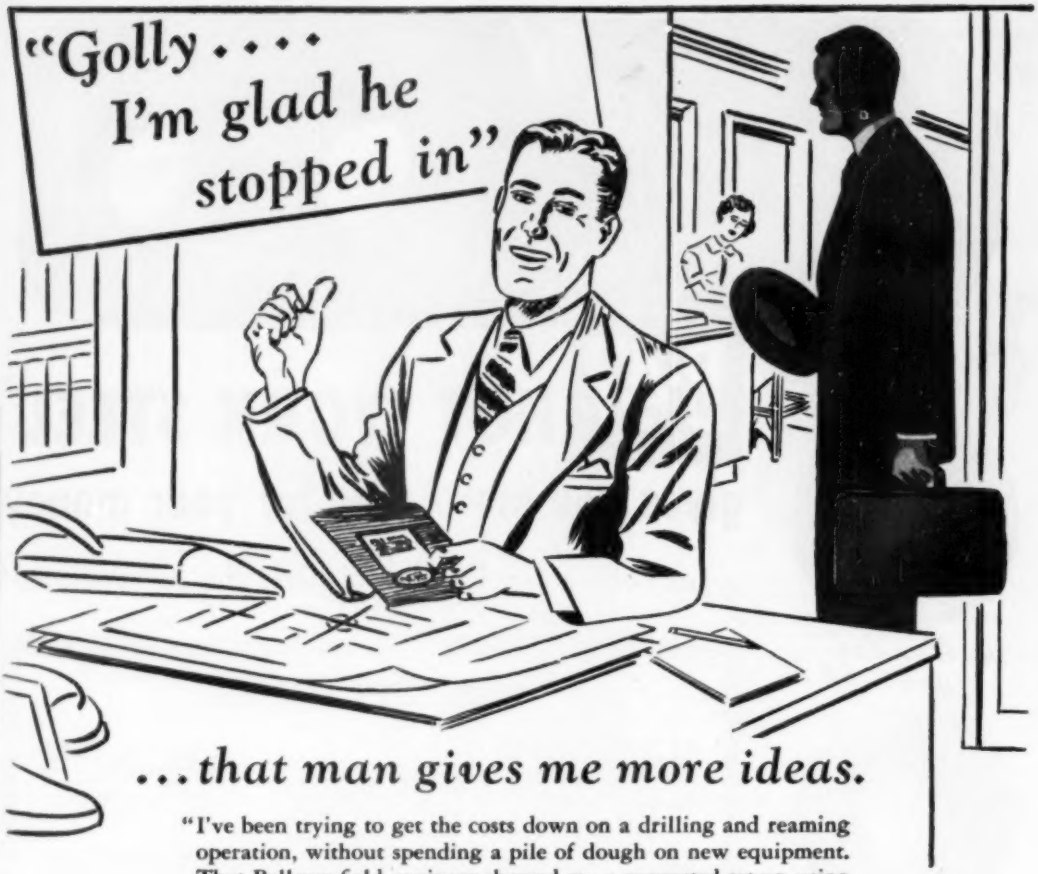
ALLEGHENY LUDLUM
STEEL CORPORATION
Pittsburgh, Pa.

TOOL STEEL DIVISION: DUNKIRK, N. Y.

Fine Tool Steels Since 1854

AL

WBD 3122



. . . that man gives me more ideas.

"I've been trying to get the costs down on a drilling and reaming operation, without spending a pile of dough on new equipment. That Bellows field engineer showed me a suggested set-up using an air-powered rotary work feed table hooked up with a couple of air-powered feeds that will be the answer on this job."

YES, your Bellows Field Engineer is a good man to know. He's one of some fifty field engineers we have in the principal cities and industrial areas. They are full time Bellows men . . . sell no other line of equipment. These men know production. They are skilled in the use of "Controlled-Air-Power." They have at their fingertips facts, photographs, wiring diagrams, motion pictures, etc., showing how plants, large and small, in all lines of industry, are using Bellows "Controlled-Air-Power" to cut costs.

When he calls to see you, talk with him. He's at your service, without cost or obligation. He can help you save time and money.

● You'll find your Bellows Field Engineer listed in your local telephone directory, or write us direct and we'll have him get in touch with you. *Dept. AM 750*

The Bellows Co.

AKRON, OHIO

115

MANUFACTURERS OF AIR MOTORS, AIR CYLINDERS, AIR-POWERED WORK AND TOOL FEEDS, AIR-OPERATED WORK HOLDING AND CLAMPING DEVICES AND OTHER "CONTROLLED-AIR-POWER" DEVICES FOR FASTER, SAFER, BETTER AND *LOWER COST* PRODUCTION.

A complete line
—DISSTON BITE-RITE* FILES
from a single good source
—YOUR LOCAL DISSTON INDUSTRIAL DISTRIBUTOR

The hardest place to make good is...at home!

DISSTON BITE-RITE® FILES are doing just that. Right in Disston plants thousands of dozens of files are used annually in the regular production of other fine Disston tools. These files prove their ability to do the toughest kind of high-precision work, within rigid cost limits. *That's what Disston makes them for!*

Others in all lines of industry are likewise guarding quality, speeding schedules, and economizing, by using Disston Bite-Rite Files. *Disston Skill* makes each shape and cut precisely uniform. And *Disston Service* is ready to help you get every last penny's worth of good work out of the Disston Files you buy. For there is a qualified Disstoneer available to analyze operations for you, and consult with you on applying Disston Files and other metal cutting tools most efficiently. *He will help you lick the jobs that lick the average tools!*

HENRY DISSTON & SONS, INC.
720 Tacony, Philadelphia 35, Pa., U. S. A.
In Canada, write: 2-20 Fraser Ave., Toronto 3, Ont.

DISSTON METAL-CUTTING BAND SAWS

You can get the correct types from the Disston line—Hardened Throughout and Hard Edge Flexible Back (in regular and buttress tooth patterns).

DISSTON HACK SAW BLADES

for a wide variety of machine and hand metal cutting operations.

IN THESE TYPES: *High Speed* • *Di-Mol* • *Chromol** • *Duraflex**

*REG. U. S. PAT. OFF.

DISSTON

TORRINGTON NEEDLE BEARINGS

carry lubricant, too

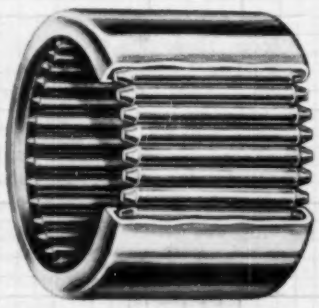
To reduce the need for frequent service attention in all types of machines, Torrington Needle Bearings carry a large reserve of grease or oil.

The turned-in lips of the outer shell ride close to the shaft, and form an effective seal that helps retain lubricant and keep out dust and moisture.

Small diameter rollers carry an even protective film to all bearing contact surfaces.

Often Needle Bearings can be lubricated for life at installation.

Let our engineers help you design efficient lubrication and other Needle Bearing advantages into your product.



THE TORRINGTON COMPANY

Torrington, Conn. • South Bend 21, Ind.

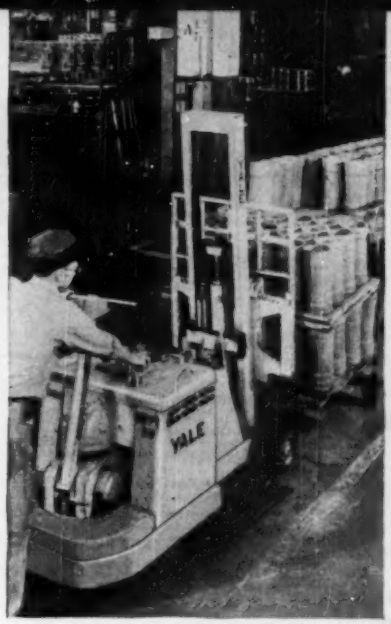
District Offices and Distributors in Principal Cities of United States and Canada

TORRINGTON *NEEDLE* BEARINGS

NEEDLE
SPHERICAL ROLLER
TAPERED ROLLER
STRAIGHT ROLLER
BALL
NEEDLE ROLLERS

GIVING COSTS THE

economy treatment...



The economy treatment—that's what handling costs are getting in more and more plants. It's high time, too, because it is estimated that unskilled workers still devote 80% of their time to moving materials. And when you also consider that at least 30c out of every production dollar is paid out to lift, transport and stack goods, you have plenty of reasons why the cost of material handling needs a good going over.

Thousands of large and small plants are already putting a big dent in handling costs by using Yale Hoists, Trucks and Scales. You can have the same economy now. Let us give you the benefit of our long and varied experience in solving material handling problems. Our recommended "economy treatment" will lead you to efficiency, speed, safety and lower costs. Phone or write today.

THE YALE & TOWNE MANUFACTURING COMPANY
Department L-119
Roosevelt Boulevard Philadelphia 15, Pa.

YALE
TOOLS THAT KEEP INDUSTRY "ON THE MOVE"

YALE

MATERIAL HANDLING MACHINERY · hoists hand and electric · trucks hand lift and power · industrial dial scales

CONTRACT WORK

KAMIS ENGINEERING COMPANY

DESIGNERS & MANUFACTURERS OF

TOOLS AND MACHINERY

WE HAVE OPEN CAPACITY FOR MACHINE WORK ON THE FOLLOWING FACILITIES:

36" to 54" Vertical Boring Mills
3" to 5" Horizontal Boring Mills
$2 to $5 Vertical and Horizontal Millers
10" to 50" Engine Lathes

SEND FOR BROCHURE #4 WHICH DESCRIBES OUR FACILITIES IN DETAIL

THIRD & MOORE STREETS
PHILADELPHIA 48, PA.

METAL PARTS

Contract Manufacturing
Stampings, Machine Work, Assemblies

BUMIS & CALL CO.
125 Main St., Springfield 2, Mass.

MANUFACTURING FACILITIES AVAILABLE

We have open capacity for machine work, iron castings and galvanizing. Will quote complete assemblies or parts. Write

MUSKOGEE IRON WORKS, Muskogee, Okla.

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We have open capacity on 4- 6- & 8-spindle automatic bar machines up to 1¼" capacity. Also 2½" capacity on single spindle automatics and universal turret lathes. Complete service including heat-treating, grinding and plating.

STRYKER MACHINE PRODUCTS COMPANY
180 John Fitch Way — Trenton, N. J.

MANUFACTURING FACILITIES AVAILABLE

Stampings 5 to 200 Ton—16" Stroke
Tool Room—Machine Shop
Plating—Painting—Assembly

BOX B — Warrensburg, Ill.

PATTERNS in WOOD and METAL

For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us—we will take care of them

GENERAL PATTERN WORKS
2233 Park Street — Cincinnati, Ohio

SEARCHLIGHT SECTION

Classified Advertising

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UNDISPLAYED —RATES— DISPLAYED

90c per line, minimum 4 lines. To figure advance payment count 5 average words as a line. Individual Employment wanted advertising ½ the above rate payable in advance.

Box Numbers—Care of publication New York, Chicago or San Francisco offices counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Individual Spaces with border rules for prominent display and advertisements.

The advertising rate is $9.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

SALES MANAGER WANTED

Machine tool selling organization. Must have practical machine tool and general business experience. Outstanding opportunity for qualified party. Young man preferred.

P7094 American Machinist
520 N. Michigan Ave., Chicago 11, Ill.

MACHINE SHOP AND RESIDENCE

Fully equipped machine shop ready for business and six room bungalow on 1½ acre lot in mountain village near industrial market. For sale at $25,000.

VAN SYCKEL, INC.
20 Hamilton Street, Bound Brook, N. J.
Phone BO 9-3200

WANTED

WANTED

4 REQ'D - GOOD, USED
Model 5000

Le Maire Tool & Mfg. Co.
Dearborn, Mich.

Twin Ram Master Units With Motors

The COMMERCIAL SHEARING & STAMPING COMPANY
Youngstown, Ohio

WANTED

CRUSH-FORM GRINDER similar to Thompson T-4, type B, with wheel approx. 12"x2". Write full details and price.

STANDARD BUTTON MACHINE CO., INC.
245 FRANKLIN ST., PATERSON, N. J.

WANTED

Double Action Toggle Type Press

500-ton Bliss-Toledo, 1940 or later, strokes 12" and 20" or 18" and 26", bed area 56"x50".

W-6886, AMERICAN MACHINIST
330 W. 42 St., New York 18, N. Y.

New "SEARCHLIGHT" Advertisements

received by 10 A. M. in the N.Y.C. office, July 11, will appear in the July 24th issue, subject to space limitations.

Classified Advertising Division
AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

REPLIES (Box No.):
Address to office nearest you
NEW YORK: 330 W. 42 St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

SELLING OPPORTUNITY OFFERED

MANUFACTURERS REPRESENTATIVE, established Drill Head manufacturer has several exclusive territories open for aggressive representatives with allied lines. Good opportunity for substantial commissions. Write stating present lines and territory to RW 6969, American Machinist.

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500-35,000. If you are considering a new connection communicate with the undersigned. We offer the original personal employment service, 40 years recognized standing and reputation. The procedure of highest ethical standards is individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present position protected. Send only name and address for details. R. W. Bixby, Inc., 266 Dun Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

MACHINE SHOP Foreman, 30 years experience, including four years as supervisor on small or large work in job or production shops, seeking responsible position. PW 7051, American Machinist.

MACHINE TOOL connection desired—graduate M.E., age 33, 10 years experience with machine tool builder, production, sales, engineering; thorough shop background. PW 6970, American Machinist.

FRENCH OWNER of small gear cutting plant - I'd like to stay and help for one month in similar firm to learn Amer. methods. No salary, first class references in U.S.A. PW 6952, American Machinist.

SELLING OPPORTUNITY WANTED

AERONAUTICAL ENGINEER graduate wants position machine tool sales. Opportunity most important. 26 years old. Will travel. SA 6988, American Machinist.

PATENT ATTORNEY

Patent Practice

before U.S. Patent Office, Validity and infringement investigations and opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine and Rommel, Registered Patent Attorneys, Suite 453, 815 15th Street, N.W., Washington 5, D. C.

IF THERE IS

Anything you want

that other readers of this publication can supply

OR—

Something you don't want

that other readers can use advertise it in the

SEARCHLIGHT SECTION OF

American Machinist

LATEST TYPE *Nearly New* MACHINES

GRAY 84" x 52" x 16' Planer Type Milling Machine
Double Housing, Power Rapid Traverse
2 heads on adjustable cross rail
1 side head
18 spindle speeds from 10 to 500 RPM
Complete with motors and electrical starting equipment. Latest type. Built new—1941.

BORING MILLS—Horizontal

DEFIANCE 2½" bar, Latest Type
DEFIANCE 3½, 4¼" bar, Latest Type
DETRICK & HARVEY 4" bar, Floor Type, M.D.
DETRICK & HARVEY #257, 3½" bar, Latest Type
GIDDINGS & LEWIS #257, 3½" bar, Latest Type
HEALD 48A, 40 single end, Borematic, Latest
LANDIS—#25—5½" bar, Floor type, M.D.
LUCAS #41, 5" bar, Table Type, Late Type
LUCAS #43, 5" bar, Table Type, Late Type
NILES-BEMENT-POND 5", 7" bar, Floor Type, M.D.
SELLERS 5" Bar Floor Type, latest type
SELLERS 5" Bar Table Type, latest type
UNIVERSAL 5" bar, high speed, latest type

BORING MILLS—Vertical

BULLARD 24", 30" Turret "New Era" Side Head, M.D.
BULLARD 24", 30", 42" Vert. Turret "Spiral Drive", High Speed, Latest Type
BULLARD 30" "Cutmaster", Latest Type
COLBURN 72", 2 swivel heads, Rapid Traverse, AC M.D.
NILES 100", 2 swivel heads, Rapid Traverse, AC M.D.

DRILLS—Miscellaneous

BARNES H-3 "Hydram" Hydraulic, 3" capacity—for inverted drilling, Latest Type
LELAND & GIFFORD #1LMB, 4 Spindle, Latest Type
LELAND & GIFFORD #2MB Single Spdle
LELAND & GIFFORD—4, #2MB Single Spdle, Latest
LELAND & GIFFORD #3 LMB 6 spindle, Latest
NATCO #4AL Multiple, 30 spindles, Hyd., Latest Type

GEAR CUTTING EQUIPMENT

BARBER COLMAN Type A Hobber, Latest
BARBER COLMAN #13 Hobber, Single and Double Worm, Motor Drive
BILGRAM 6" and 16" cap., Bevel Gear Gen., M.D.
BROWN & SHARPE #13 Spur and Bevel Cutter, M.D.
BROWN & SHARPE #18 Tooth Rounding Machine, Motor Drive
CROSS #1 Tooth Chamfurer, Latest Type
CROSS #50 Gear Chamfurer, Latest Type
FELLOWS Model 61, 61A, 62S, 7A, 72, 72S, 77
FELLOWS High Speed Gear Shaper, Latest Type
FELLOWS #12M Involute Measuring Instrument, latest
FELLOWS #18L6 Lapper, latest type
GLEASON #14 Hypoid Spiral Grinder, Latest Type
GLEASON 2", 12" straight bevel generator, latest type
GLEASON #4, #6, #13 Bevel and Hypoid Tester
GLEASON #16 Hypoid Generator, Latest Type
GLEASON 24", 32", 77" 90° Straight and Bevel Gear Planer, Motor drive
GOULD & EBERHARDT 12H Hobber, DIFF., Latest
GOULD & EBERHARDT 18H Hobber, Motor Drive
GOULD & EBERHARDT 96H Hobber, with diff., M.D.
GOULD & EBERHARDT Hobber with Infeed and Differential, Motor Drive
NEWARK #5, 12" Hobber with Infeed and Differential, Motor Drive
PRATT & WHITNEY 10" Grinder, hyd., latest
SCHUCHARDT & SCHUTTE #1 Hobber, Motor Drive

GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
BROWN & SHARPE #5 Plain, 8" x 12, Latest Type
BROWN & SHARPE #5 Univ., Model ER, Latest Type
CINCINNATI 12"x48" Univ., Model ER, Univ., Latest Type
CINCINNATI 16"x36" Model ER, Univ., Latest Type
LANDIS 6"x18, Type H, Plain Hyd., Latest Type
LANDIS 6"x18" Type C Plain, Hyd., Latest Type
LANDIS 20"x132" Plain Roll, Motor Drive
NORTON 6"x18", 6"x36", 14"x36", 16"x72" Type C, Plain, Latest Type

GRINDERS—Miscellaneous

BARBER COLMAN #3, Hob Sharpener, Latest
BROWN & SHARPE No. 13 Univ. Cutter & Tool, Lat.
BRYANT #3, #6, 16-C-18, 16-CP-18, 24-36" Internal, Hydraulic, Latest Type
CINCINNATI "Monocon" Tool & Cutter, Latest
FITCHBURG 14"x36" Spline hydraulic, latest
GARDNER 24-52" Disc Grinder, Latest
GLEASON #13 tool sharpener, Latest Type
HEALD 72A3, 72AS "Gagematic" Internal, Latest
HEALD 72A3, 73AS, 74 Internal, latest type
HEALD 72A3, 73AS, 74 Internal Size Control, Latest Type
HEALD #81 Internal Gagematic, Sizematic and Gage-matic, Latest Type
HEALD #81 Internal, Centerless, Sizematic and Gage-matic, Latest Type
KEARNEY & TRECKER Face Mill Grinder, Latest
LANDIS #6, 6x24 Thread Chaser, latest type
LA POINTE 6x" Universal Broach Sharpener, Latest
THOMPSON 6"x18" Auto. round broach M.D.
VAN NORMAN #639, #73 Cer. Radius Grinder, Latest
VAN NORMAN #666 Crankshaft ReGrinder, Latest

GRINDERS—Surface

ABRASIVE 3B, 8"x24" Hyd., Latest Type
BLANCHARD #11, 16" dia. mag. chuck, Latest
BLANCHARD #18, 24" dia. mag. chuck, Motor Drive
BLANCHARD #16, 24" dia. mag. chuck, Motor Drive
BLANCHARD 16A Vertical, Dial Feed, Motor Drive

HANCHETT Series 300 12"x18" Vert. Hyd., Latest
HANCHETT #36 Vert. 36" dia. mak. chuck, Latest
HANCHETT #120 30x120" Plano, Hyd., Horiz. Latest
HEALD #22 Rotary, 12" chuck, latest type
HEALD 25A—rotary—16", 24" 30" chuck, Hyd., Latest
NORTON 6x18 Hydraulic, latest type

JIG BORERS

KEARNEY & TRECKER Model B Automatic, Latest, latest type
KNIGHT #4 Precision, Latest Type
PRATT & WHITNEY 1A, Motor Drive
SOCIETE GENEVOISE (SIPE) #4 Precision, Table 19"x27", Motor Drive

LATHES—Engine and Mfg.

AMERICAN 26"x360 centers, 2 carriages, motor drive
JONES & LAMSON "FAY" 20"x52" Automatic, Latest
JONES & LAMSON "FAY" 20"x52" Automatic, Latest
JONES & LAMSON "FAY" 24"x24" Automatic, Latest
JONES & LAMSON "FAY" 24"x24" Automatic, Latest
LeBLOND 21"x96" Centers, Geared Motor Drive
LEHMANN 16x20" Centers, TIMKEN, latest type
LEHMANN 16x20" Centers, TIMKEN, latest type
LODGE & SHIPLEY 16"x30", 14"x30" Timken, Latest
LODGE & SHIPLEY 18x72 centers, M.D.
LODGE & SHIPLEY 18x72 centers, 8x24, Latest
LoSWING 4x60, 4x84, 8x60, 9x108, 8x24, Latest
MONARCH 12"x30" Centers Model CEX, Timken, late
MONARCH 12"x54" Centers, Geared Head, M.D.
MONARCH 24"x54" Centers, Geared Head, M.D.
MONARCH 24"x192" Centers, Model CM, Timken
MONARCH 25"x192" Centers, 2 Carriages, Timken Bearing, Model CM, Motor Drive
MONARCH 27"x456" Centers, Timken Bearing, Model CM, Motor Drive
NILES 20"x56" Boring "Time Saver" Timken, Latest
PRATT & WHITNEY 16"x30" Centers, Timken, Latest
PRATT & WHITNEY 16"x30" Centers, Bench, latest
PRATT & WHITNEY Motor Lathe
PUTNAM 42"x25" Centers, Model A, Latest
REED PRENTICE 24"x54" Centers, Timken, latest type
SPRINGFIELD 16"x30" centers, Timken
WARD, HAGGAS & SMITH—16/30x96" centers gap, motor drive, Latest Type

LATHES—Hob and Cutter Relieving

CLEVELAND 12"x16" Centers, Cutter, Motor Drive
MICHIGAN 1712 Universal, Latest Type
U.S. Tool #510B, 9"x15" Centers, Cutter, Latest

LATHES—Turret

BARDONS & OLIVER #5, #7, TIMKEN, Latest Type
CINCINNATI ACME No. 1 Timken, Latest
FOSTER, #4FU "Fosternatic," Timken, Latest
GISHOLT #11, #2L, #2L Universal, Timken, Latest
GISHOLT #11, Timken, Latest Type
GISHOLT #3, #4, Univ., Timken, Latest
JONES & LAMSON #3 Univ., Timken, latest
LIBBY "International" 1315 Univ., Timken Bearing, latest
MOREY No. 2C, No. 3, No. 4 Timken Bearing, latest
POTTER & JOHNSTON #5DE, Timken, Latest
WARNER & SWASEY 5, Universal, Latest Type
WARNER & SWASEY #3, Timken, Timken Bearing
WARNER & SWASEY #1A Universal, Timken Bearing
WARNER & SWASEY #1A Universal, Timken Bearing, Pre-Selector, Bar and Chucking, latest type
WARNER & SWASEY 2A Universal, Timken Bearing "Pre-selector" Bar and Chucking, Latest Type
WARNER & SWASEY 3A Universal, M.D.

MILLING MACHINES—Mfg.

GRAY 84"x52"x18' Planer Miller, 2 heads, Latest Type
HALL Style L, Planetary, latest type
INGERSOLL 42"x38"x12" adj. rail, 4 heads, AC, M.D.
INGERSOLL 32x24x16" Planer Type 2 heads, AC, M.D.
INGERSOLL 32x24x12" adj. rail slab, M.D.
INGERSOLL 20x24x12" adj. rail, Latest
SUNDSTRAND Model 2A Duplex 12" feed, Latest
TAYLOR & FENN Mod Duplex Spline, latest

MILLING MACHINES—Plain

BROWN & SHARPE #2, Light Type, Timken, Latest
BROWN & SHARPE #13, 24" feed, Latest Type
BROWN & SHARPE #000, Timken, Latest Type
BROWN & SHARPE #2B, 2B, Timken, Latest Type
BROWN & SHARPE #2B, 2B, 2-18 Automatic, Latest Type
CINCINNATI 0-8, 1-12, 2-18 Automatic, Latest Type
CINCINNATI #5, #4, #3 High Power, Late Type
CINCINNATI 4-36 Hydromatic, Simplex, Latest Type
CINCINNATI 4-36 Hydromatic, Simplex, Latest Type
KEARNEY & TRECKER #2H, 2H, 4H, 5H, Latest
KEARNEY & TRECKER 1318, 1404, Simplex, Latest
KEMPSMITH #3G, #4 Timken, Latest Type
KEARNEY & TRECKER 4K, Timken, Late

MILLING MACHINES—Thread

LEES BRADNER Model LT, 6"x36" Centers, Latest
LEES BRADNER Model HT, 15"x24" Centers, Latest
LEES BRADNER 1500, 1500 centers, Latest Type
MOREY 1236" bet., 1500, 1512" Model C, Latest Type
PRATT & WHITNEY 6x36" Model C, Latest Type
PRATT & WHITNEY—Universal

MILLING MACHINES—Universal

BROWN & SHARPE No. 2A Timken Bearing, Latest
BROWN & SHARPE No. 3A, 4A, Motor Drive
CINCINNATI #2MH, Timken, Latest Type
CINCINNATI #2H, Timken, Latest Type
KEARNEY & TRECKER 2H, Timken, Latest Type
KEMPSMITH #4 Maxi-miller, Timken, latest type
VAN NORMAN #3 duplex, Motor Drive
VAN NORMAN #28, #36, Timken, Latest Type
VAN NORMAN

MILLING MACHINES—Vertical

BROWN & SHARPE #2 Standard Timken, Latest
CINCINNATI #2, Dial Type, High Speed, Latest
CINCINNATI #2H TIMKEN, Latest Type
CINCINNATI #08 TIMKEN, Latest Type
GORTON 8D, 8½D Super-Speed, Latest Type
GORTON 8D, 8½D Super-Speed, 2H, 2K, 3H Timken, Latest
KEARNEY & TRECKER 2H, 2K, 3H Timken, Latest
MOREY 12M Single & Double Spindle Profiler, Latest
REED PRENTICE 3VG, with or without hydraulic duplicator, Timken bearing, Latest Type

PLANERS

BETTS (CONSOLIDATED) 84"x20"x16' 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
BETTS (CONSOLIDATED) 108"x24"x48' 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
CINCINNATI 30"x30"x8' 4 heads, PBT, DC, M.D.
CLEVELAND 30"x48"x16' 4 heads, Hydraulic
DETRICK & HARVEY 48"x84"x16' 4 heads, Box Table, A.C. Motor Drive, Rapid Traverse, A.C., 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
NILES 108"x84"x12' 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
NILES 48"x18"x13' "Time Saver", Box Table, 3 heads, D.C. reversing motor, Latest Type
NILES 72"x42"x14' "Time Saver" Box Table, 2 Heads, PBT, VARI-VOLTAGE Drive, Latest
NILES 96"x36"x24' 4 heads, Rapid Traverse, Box Table, D.C. reversing motor drive

PRESSES

BIRDSBORO 295 ton, vert, hyd., Latest Type
BIRDSBORO 75-35 Hydro-Dynamic, Double Action, Latest
BLISS 75-35 Hydro-Dynamic, Double Action, Latest
CLEARING K-1206-50 Knuckle Joint, 200 ton, 6" stroke, Latest Type
GLEASON 15" Quenching, Hyd., Motor Drive
LAKE ERIE 500 ton Vert. Hyd., Latest Type
TOLEDO #93A, 88 ton geared, Motor Drive
NIAGARA #61B, 88 ton geared, Motor Drive

SCREW MACHINES—Automatic

CLEVELAND 9/16", 1-1/16" Model A, Latest Type
CONOMATIC 2¾"—6 spindle, High Speed, latest type
CONOMATIC 3½" 6 spindle High Speed, latest type
CONOMATIC 3½" 6 spindle Chucker, Work Reels
GOSS & DeLEEUW 7" 6 spindle Chucker, Work Reels
GOSS & DeLEEUW 9" 8 spindle Chucker, Work Reels
GOSS & DeLEEUW 9" 8 spindle Chucker, Work Reels
Tailing, Latest Type

SHAPERS & SLOTTERS

AMERICAN 20" Heavy Duty, Motor Drive
CINCINNATI 20" High Speed, Latest Type
DILL 20"x24" Vertical, Motor Drive
LAMARRE 18" Vertical, Hydraulic, Latest Type

SHEARS—Power

QUICKWORK #5, ¾" Cap., Rotary Shear, M.D.
QUICKWORK #6, 1" Cap., Rotary Shear, M.D.
WYSONG & MILES #572, 14 gauge x 6' Latest Type

MISCELLANEOUS

AJAX 3½" Forging and Upsetting, M.D.
BAKER #5 Keyseater Motor Drive
BARNES #172, 306H, 207, 507B Vertical Hone, Hyd., Self Oiling, Latest Type
CAMPBELL #401 Abrasive Saw, Latest Type
CINCINNATI 1-30 Vertical Hydro-Broach, latest
DE LAVAL #194 Coolant Clarifier, Latest
FOSTER 4"x18", 6"x36" Superfinisher, Latest
HELLER Model 8S-1 Cold Saw, 6" cap., M.D.
LANDIS 3 Single Spdle. Bolt Threader, M.D.
NATIONAL 4" Upsetter, latest type
NAZEL #4B Pneumatic Hammer, M.D.
PEERLESS 16"x16" Hydraulic Hack Saw
PRATT & WHITNEY (KELLER) Type BL-3416, Type G, Copying 3 and 3 dimensional, Latest Type
ROWBOTTOM Cam Miller, Motor Drive
STURDYBENDER 5/16"x4' Power Press Brake, Latest

WATCH THIS PAGE

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BORING MILLS

		PRICE
3" Bar #2 D & H Floor Type Horizontal Boring Mill		$1650.00
4" Bar #1 D & H Floor Type Horizontal Boring Mill		1450.00
4½" Bar NBP Duplex Horizontal Boring Mill		1850.00
3½" Bar Rochester Horizontal Table Type Boring Mill		1850.00
2—42" Colburn Vertical Boring Mill with 2 Heads	ea.	2250.00
24" Bullard Vertical Turret Lathe		2250.00
42" King Vertical Boring Mill with 2 Heads		2250.00
52" Gisholt Vertical Boring Mill with 2 Heads		2350.00
42" Bullard Vertical Turret Lathe		2750.00
2—86" Colburn Vertical Boring Mill with 2 Heads	ea.	2750.00

RADIAL DRILLS

3—6'-15" Column Cincinnati-Bickford Universal Radial Drills	ea.	1000.00
2—6'-15" Column Cincinnati-Bickford Radial Drills	ea.	1000.00
6'-10" Column American Triple-Purpose Plain Radial Drill		2300.00
7'-10" Column American Triple-Purpose Plain Radial Drill		2450.00
6' NBP Heavy Duty #10 Right Line Radial Drill		1250.00
5' NBP Heavy Duty #10 Right Line Radial Drill		1450.00
6'-17" Column American Triple-Purpose Plain Radial Drill		1600.00

MILLERS

#4 Cincinnati Plain Miller, G.H.		1950.00
2—#2 Cincinnati Vertical Millers, G.H.	ea.	850.00
#3B Milwaukee Plain Miller, G.H.		1400.00
6" x 14" P&W Precision Thread Miller, G.H.		750.00
#5 Cincinnati Plain Miller, G.H.		2250.00
#3 Cincinnati Plain Miller, G.H.		1400.00
#2 Cleveland Heavy Duty Plain Miller, G.H.		450.00
#4-B K & T "Milwaukee" Plain Miller, G.H.		1950.00
#3 Cincinnati Vertical Miller, G.H.		1850.00
#3 Kempsmith Maximiller Plain Miller, G.H.		1200.00

GRINDERS

O. S. Walker Single Stroke Surface Grinder		550.00
#2 Cincinnati Centerless Grinder with Filmatic Spindle		1450.00
#2 Cincinnati Centerless Grinder		1100.00
3—24" Ingersoll Face Milling Cutter Grinders	ea.	250.00
#18 Blanchard Rotary Surface Grinder		1250.00
#5-T Sellers Tool Grinding Machine		700.00
#72A3 Heald Internal Grinder		850.00
84" Covel-Hanchett Knife Grinder		1200.00

PLANERS

4—36"x36"x10' Cincinnati Heavy Duty Planers with 2 Heads	ea.	2500.00
30"x30"x8' Gray Heavy Duty Planer with 2 Heads		2250.00
36"x36"x8' Gray Heavy Duty Planer with 2 Heads		2250.00
48"x42"x16' D&H OS Planer with 2 Heads		2750.00
36"x36"x16' Gray Planer with 4 Heads		2200.00

LATHES

	PRICE
#2 Niles Coster Drive Axle Turning Lathe	$1750.00
30"x10' American Geared Head Engine Lathe	2250.00
28"x12' LeBlond Heavy Duty Rapid Prod. Boring Lathe	2350.00
18"x6' Simmons Engine Lathe	1250.00
16"x10' Geared Head Spring/Reid Tool Room Lathe	850.00
10"x36" Geared Head Reed-Prentice Engine Lathe	450.00
16"x6' Geared Head Monarch 8 Speed Engine Lathe	800.00
26" Libby Turret Lathe	1700.00
#3-AL Gisholt Heavy Duty Turret Lathe	2100.00
#2M-10 Libby International Heavy Duty Turret Lathe	2900.00
#2-B Simmons MS Turret Lathe	700.00

GEAR CUTTERS & HOBBERS

Bierneatzki Gear Hobber, 30"	750.00
18" Gould & Eberhardt Gear Hobber	1200.00
36-H Gould & Eberhardt Gear Hobber	2750.00
30" Gould & Eberhardt Spur Gear Cutter	750.00
#4 Brown & Sharpe Gear Cutter	1200.00
60"x12" Gould & Eberhardt Spur & Bevel Gear Cutter	1850.00

PUNCHES & SHEARS

100 Ton Straight Side Double Back Geared Shear	1100.00
#4 Canton Alligator Shear	1500.00
#2 Long & Allstatter Double End Punch & Shear	2200.00
Mohr Shear or Punch	1200.00
#3 Long & Allstatter Single End Punch & Shear	1300.00
#5 Long & Allstatter Single End Punch & Shear	450.00
#5 Hilles & Jones Single End Punch or Shear	1850.00
48" Cleveland Punch or Shear	1350.00
#900 Hilles & Jones Punch	350.00
#3 Long & Allstatter Shear	400.00
Spacing Punch	200.00
#215 Steil Rotary Slitting Shear	125.00

MISCELLANEOUS

2—#310 Baker High Speed Drills	ea.	550.00
60" Newton Cold Saw		1000.00
15" Newton Crank Slotter		900.00
28" Morton Draw Cut Shaper		525.00
36" Morton Draw Cut Shaper		1250.00
16" Dill Slotter		1300.00
30" Baker Heavy Duty Draw Stroke Slotter		1100.00
8" Newton Slotter		700.00
48" Morton Keyseater		650.00
#3 Baker Keyseater		1250.00
10'x¼" Capacity #26 Robinson Bending Machine		2300.00
#3-B LaPointe Broaching Machine		325.00
#6 Hilles & Jones Pneumatic Flanging Clamps		750.00

All the above machines are offered in good mechanical condition. For further particulars phone, wire or write—

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#14 Buffalo Steel Billet Shear, 5½" round capacity

#10 Buffalo Steel Bar Cutter, 3½" round capacity

Artos Wire Stripper

#80 Cameron Rotary Cap Thread Roller, M.D.

#10 Mitts & Merrill Airfluff Paper Shredder, M.D.

#3Z Gorton Pantograph Engraving Machine with roll die att.

12"x12" Type DA Dings Magnetic Chip Separator.

#40-5 Minster S.S.—D.B.G. Press, 16" stroke

#2G Brown & Sharpe H.S. Automatic Screw Machine, serial 13000 plus

#4 LaPointe Broach, 50 ton capacity

50 Ton Henry & Wright Dieing Machine

10"x18" Cincinnati Model EA Grinder, serial #5P2A1L-13

#5-60 Cincinnati Hydromatic Production Mill

MACHINE TOOLS

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942 WEST LAKE STREET • CHICAGO 7, ILLINOIS

LATHE — Engine, Mack. Hemphill 72"/110" x 30" centers (1943)

HYDROTEL—Cinc. Vert. Miller, 28"x60", 4 Spindles, 3600 Automatic Tracer (1942)

PLANER—N.B.P., 48"x48"x26', 4 Heads

PUNCH—Beatty No. 7—1¼" thru 1" (1947)

BORING MILL—D. & H. 3½" Floor (Bargain)

ROLLS—Bending—H. & J. 36"x1½" Pyr. Southwork 15"x3" Pyr., Vertical

ROLLS—Angle—Bertsch 3"x3"x½"

SHEAR-ALLIGATOR—(#2) 24" Blade, 3" Rds., etc.

SLOTTER—Newton 24"x42" Table (Rebuilt).

THREAD MILL—Morey 12"x10' centers (1942).

PRESSES—Z & H #7—50 Ton, Percussion
Bliss #6—125 Ton (Late)
Clearing—200 Ton, 30" Stroke
Bliss #310—450 Ton, 18" Stroke
Hydraulic Presses—375, 500, 675, 750, 3,000 Tons (Late)

(2) O.E.T. Cranes 10 Ton x 62' Span New, Never Used. 3 Motors 3/60/-440A.C. Floor Control

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10 Ton lifting capacity Link Belt Speeder Model YC 9 Serial 2002. New 1943. 14'-25' Telescopic boom with 30' jib extension—4 line hook block for heavy lifts and single line hook for light loads—full revolving type—hydraulic controls—solid rubber tires—8 cylinder Buda 65 H.P. gasoline engine.

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Famco Power Shear—42"—18 Ga.
Keller—BG-1—Complete.

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AUTOMATICS
Brown & Sharpe, No. 00G.
Fay Automatic, 12"x81".

BORING MILLS
Giddings & Lewis No. 0, No. 25T.
Lucas No. 31, horiz.
Heald #49 double spindle, #48A
Universal 3" horiz. equipped.
Bullard 24", 36", 42" VTL
King 72" vertical

DRILLS AND RADIALS
Barnes No. 242, No. 5 Morse
Carlton 8'-19" column
Canedy-Otto 3'-9" col.
NATCO No. B225H multi-spindle
Cinci-Bickford 21" Box Col. S. S.
Sibley 24"-38", Power Feeds
Hamilton, Langelier, Hi-Speed.

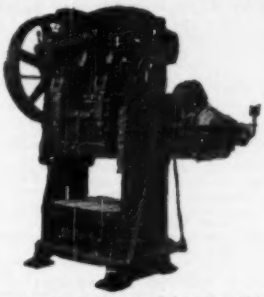
ENGRAVERS
Gorton No. 3U & 3L
Deckel GIL, 2 dimen.
Gorton Cutter Grinders 375-2, 265-6.

GEAR EQUIPMENT
Barber Colman No. 3 Precision
Fellows #7, 72, 712, 725, 7125, High Speed.
Fellows 645Y Spur & Spiral
Gleason #2 Surface Hardener.
Gleason 3" Spur Bevel Generator
Hamilton Hobber #90
Michigan, Gleason, Fellows Checkers.
Mikron Gear Hobber.

GRINDERS, MISCELANEOUS
Brown & Sharpe No. 5 cyl. 3" x 18", 3" x 12".
B. & S. Nos. 1, 2, 3 Univ.
B. & S. No. 13 Univ. & Tool.
Cinn. No. 2 Centerless Filmatic.
Cinn. 12 x 48" Filmatic Univ.
Cinn. #2 Univ. Tool & Cutter
Covel No. 91A Univ. T. & C.
Dalzen Thread, latest
Gardner #226, 80" Disc.
Hanchett #228 Disc. Dbl. opposed w. M.D. Feed.
Heald 72A3 Sisematic Int. Centerless.
Jones & Lamson Thread, Univ. TG 630.
K.O. Lee Tool & Cutter.
Landis No. 4H Cyl. 4 x 12". No. 6 Thread, 10 x 36" angu.
Norton No. 2 Tool & Cutter, Hyd.
Oliver 510 Drill Grinder, Sellers 4G Drill Grinder

GRINDERS, SURFACE
Abrasive #2B, 8"x24" cap.
Abrasive No. 35, 34 Vert. 8x24.
Blanchard No. 11, 16" Mag. Chuck.
Blanchard #16A—30" Chuck
Blanchard #18-30" & 36" Chuck
G & L Hyd. #25, 6x18", #35, 8x24", #45, 12x24".
Hanchett Model 300, 13 x 48".
Heald #25A Rot. Surf 16" hyd.
Norton 6x18", and 10x36" Hyd.
Reid No. 2A P.F. MIB.
Reid No. 2C Motor Spdl. Hand Feed.
Thompson Hyd. 6 x 10 x 18", 6 x 12 x 18"

LATHES
Bradford 14"x6', G.H. Latest Sebastion 12"x4'
Hardinge Precision, 1" Collet Cap., Rivett. Precision.
Hendey 12" x 42" GH.



Bliss Double Crank Toggle Press No. 406—48"

Bliss #3½A Toggle Press Geared.
Bliss No. 304A, 306 Straight Side Presses.
Bliss #B—Bed 42x96"—250 Ton.
Bliss 645B, 650 High Production Presses.
Henry & Wright 25 and 75 Ton Dieing Presses.

HYDRAULIC PRESSES

DOWN MOVING RAM, SELF CONTAINED

MANUFACTURER	TON CAP.	STR.	OPENING	PLATEN
Lake Erie	500	36"	68½"	35 x 36
M.P.M. Double Action	500	24"	30"	36 x 36
Watson Stillman Shaft Straightener	500	24"	97"	24' bed.
Denison	25/50	18"	23"	22 x 20
Hamilton	50	20"	30"	22 x 30
Southwark, D. A. Clamping Plate	125	30"	2' to 4'	84 x 30
Oilgear Shaft Straightener	35	8"	12"	84 x 11

DOWN MOVING RAM, WITHOUT POWER UNIT

Mesta	750	42"	80"	44 x 44
Chambersburg	300	10"	27"	22 x 36
Southwark	350	42"	78"	28 x 48
Southwark	550	23"	68½"	42 x 32

UP MOVING RAM PRESSES

Watson Stillman	100	8"	11½"	18 x 18
Southwark	400	20"	27" to 48"	34 x 24
Waterbury Farrel	800	6½"	28"	22 x 24
Birdsboro	800	20"	30" to 48"	40 x 32
Watson Stillman	300	12"	21"	24 x 20
Watson Stillman	300	12"	19"	20 x 20
HPM	180	15"	14½"	30 x 30
Dunning & Boschert Molding Press	300	12"	38"	24 x 32 Mold
Stokes Molding Press and Pump	50	7"	24"	20 x 12
Stokes Molding Press and Pump	150	8"	31"	24 x 23
Elmes—With Elec. Plates	50	6"	12"	18 x 18
Stewart Boling	85	10"	19"	20 x 20

WHEEL PRESSES

NILES — 600 ton 96" 500 ton — 48"; 300 ton — 48.

INJECTION MOLDERS

ACCUMULATORS

Mfr.	Size	Pounds
HPM	6" x 9'	2000
General Electric	15" x 11'	400
Watson Stillman (12 gal) Hydr. Pass.	42 x 9 x 48"	3000

Hendey G.H. 16x30", Rol. Att.
LeBlond Regal 10"x3½', 13"x24", 15"x30", 16"x48" TA. 19"x48", TA. 21"x60"
LeBlond Heavy duty 16"x30".
Lodge & Shipley 16 x 78" T.A., Collets, etc. and 20" x 54" equipped.
Lodge & Shipley 20"x54" G.H. 24 Spindle Speed latest
Monarch 10"x20" EE. 16"x54" T.A.
Monarch 12x30" Dble. Compound, swings 18", 12"x30" CKK
South Bend Q.C.G., 13"x6', 10"x4'

MILLS, PRODUCTION
Brown & Sharpe, No. 000, 12, 21.
Cincinnati No. 1-12, 1-18, 2-18 Mfg., 50-96 hydromatic
U. S. Multimiller, 1 and 2 Spindles.
Sundstrand 60 Rigidmills, Kent Owens IV.

MILLS, PLAIN AND UNIVERSAL
B. & S. No. 2B Pl., No. 2A Univ.
Cincinnati No. 3 Plain, 2M Plain
Cincinnati No. 2MH Univ., H.S.
Milwaukee 2HL, 2H Univ., H.S.
Milwaukee No. 2H Plain.
Van Norman Duplex, 12, 20, 22L, 36.

MILLS, VERTICAL
Index, Jackson
Brown & Sharpe No. 2 Standard.
Cincinnati No. 4, Hi-Power.
Gorton No. 8D, 9-J Plain.
Morey No. 12M Profiler 2 sp.
Sipp MP5 Jig Borer. & No. 42A
Fosdick #30 & 42A Jig Borers.
Pratt & Whitney #2 Jig Borer

PRESSES
Bliss No. 18, 19, 20, OBI.
Bliss No. 304A, 4" Str. 23"x24" bed, #306 w. Air Cushion. S.S.
Bliss No. 645B, 650 Hi-Production, 58, 62, 62A, 162.
Bliss No. 4½ Double Action Cam Gen. flexible Screw Press.
Henry & Wright Dieing, 25 Ton, 75 Ton.
L & J #2, O.B.I. & V & O #01
Reliance 45 Ton, O.B.I.
Z. & H. 30 Ton, O.B.I.
Stoken Tablet Presses, Model R & T, DD2, & Colton Tablet Presses.

TURRET LATHES
Acme No. 4W, 6 W Bar and Chuck, Acme Fox.
Bardons & Oliver No. 3, 1½" cap., No. 5, Chuck.
Brown & Sharpe No. 1, 1F
Foster No. 3B.
Gisholt No. 4, 5 Bar and Chuck, 2L, Saddle Type
Jones & Lamson #5 Univ. Preselector head.
Warner & Swasey No. 3, 5, Preselector, No. 4A 8" Cap.

MISCELLANEOUS
Band Saw: Tannewitz No. 36M.
Broach: American Horiz. Hyd. H-15-60.
Comparator: J & L 14" pedestal
Hackshaw: Marvel Nos. 6 and 6A, 9A Automatic Feed.
Marking Machine: Noble & Westbrook
Notching Press: Ferracute C82.
Pin Machine: Nilson.
Shaper: Sheldon 12" Brand New
24" Rockford Hyd. Heavy Duty.
Honer: Micromatic Hydrohoner, Sunnen.
Keyseaters: Mitts & Merrill, Baker, Burr, Davis.
Rivet Hammers: Hi Speed, Chic. Pneumatic.
Toolmakers Microscope: Gaertner, Bausch & Lomb, Leitz
Router: #55 Oliver.
Tapper: Bakewell #1, #2
Haskins No. 3C, 3CAM.
Welders: Spot & Seam: Thompson, Taylor, Winfield.
Wrapping Roll: #1½ Buffalo

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MONA MOTORS

LATEST TYPES — GUARANTEED MACHINE TOOLS 1941-1950 MODELS

MILLING MACHINES
CINCINNATI: #3 Vertical M.S.
CINCINNATI: #2M Vertical, Rotary table
CINCINNATI: 6-S Vertical
SUNDSTRAND: 9B Rigidmil—Duplex (for milling cam tracks in propeller hubs or similar work)
SUNDSTRAND: #9B Rigidmil—Hydr.
SUNDSTRAND: #9B Rigidmil
MOREY: 12M 2-spindle Profiler
TAYLOR-FENN: M-50 Duplex Spline
TAYLOR-FENN: Vertical
RICE-BARTON: Duplex Spline

THREAD MILLERS & TAPPERS
HANSON-WHITNEY: 8"x10" Thread
MOREY: 12"x60" Thread Miller
LEES BRADNER: 40A Thread Miller
HALL PLANETARY: B & C Thread Millers
MURCHEY: #22 Tapper, Horiz.
PRODUCTO: Hand Tapper

TOOL SHARPENERS
OLIVER: 2A Face Mill
OLIVER: 510 Drill Pointer
OLIVER: 10" Tool Bit—Template
FELLOWS: Flat Top Helical Gear Cutter

GRINDERS—THREAD
EXCELLO: #31 & #33 Ext.
JONES & LAMSON: TG-636 Ext.

GRINDERS—CYLINDRICAL
NORTON: 12"x36" Universal
LANDIS: 10"x18" "C" Plain Hydr.
LANDIS: 10"x32" Type "D" Crankpin, Hydr.
CINCINNATI: #2 Centerless
CINCINNATI: 6"x18" & 10"x72" Hydr. Filmatic
BROWN & SHARPE: #10 & #23 Plain

GRINDERS—INTERNAL
HEALD: 70A Plain
HEALD: 72A3, 72A5 Plain & Univ.
HEALD: 72A3 Sizematic Centerless
HEALD: 72A5 Sizematic
HEALD: 173 Sizematic Gap Bed
BRYANT: 112 Universal, Hydr.
BRYANT: 16-28 Hole Grinder
BRYANT: 24-36 Heavy Duty
RIVETT: #10H Tool Room

GRINDERS—RADIUS
VAN NORMAN: #73, 620, 630, 639, 649 OSC.
VAN NORMAN: #3½ Universal

GRINDERS—SURFACE
THOMPSON: 6"x12"x18" Type B
THOMPSON: 12"x12"x40" Type B
THOMPSON: 12"x18"x96" Type C
THOMPSON: 30"x30"x120" Type C
HEALD: #22 Rotary—12" Chuck
ARTER: A-1-8" Rotary
GARDNER: 120A Opposed Head Disc

NEW MACHINE TOOLS AT PRICE OF LATE USED MACHINES
*WEBSTER & BENNETT: Vertical Boring Mills 36", 48" & 66"
*HERBERT: Turret Lathes Ram & Saddle Types
*HERBERT: Automatic Single Spindle Chuckers
*NIFE: Universal Tool & Cutter Grinder
SYKES: Herringbone, Helical & Spur Gear Machinery
RUSSELL: Cold Saws, 8"x10" capacity
WICKMAN: Swiss Type Automatics
WICKMAN: Optical Profile Grinder
MacNAMARA: Automatic Wire & Strip Forming Machines
Note: *Machines can be demonstrated in our showroom.

HONING & LAPPING
MICROMATIC: H-510 D.E. Horiz.
MICROMATIC H-2 S.E. Horiz.
NORTON: #26 Hyprolaps
NORTON: #2F×40" Hand

GEAR & SPLINE GRINDERS
PRATT & WHITNEY: 10" single & double wheel
GEAR GRIND. MACH: GG-19 (10"x24"). Hydr. Spur Gears & Splines
GLEASON: #17 Spiral, Zerol & Hypoid Bevel

GEAR CUTTING MACHINES
BARBER-COLMAN: #3 Hobber
FELLOWS: 6I, 7, 72 Shapers
FELLOWS: Straight Line Generator
GLEASON: 3" Straight Bevel Gear
GOULD & EBERHARDT 12H Hobber

GEAR FINISHERS & TESTERS
FELLOWS: 8LSI & 13LSI Gear Lappers, External & Internal, Spur & Helical
FELLOWS: #4 Fine Pitch Shaver
FELLOWS: #12-C Spacing Tester
GLEASON: #13 Universal Tester
GLEASON: #4 & #6 Bevel Gear Testers, Hand & Power Operated
GLEASON: 3" Bevel Gear Tester
ILLINOIS: #224 Involute Checker
RED RING: 81C-12" Gear Tester

PRECISION BORING
HEALD: 48A S.E. 2-spindle
HEALD: 47A S.E. 2-spindle
HEALD: 46B Double End

LATHES—PRODUCTION
LIPE-ROLLWAY: 15"x30" Carbomatic
LEBLOND: 25"x48" Engine Lathe, raised to swing 40"

LATHES—TURRET
BULLARD: 24", 36" Vert. Spiral Drive
GISHOLT: No. 4 and 5, Ram Type
JONES & LAMSON: 7A Saddle Type

DRILLING MACHINES
LELAND-GIFFORD #2LMB Deep Hole Vertical
BARNES: 20½ 2 spindle wide base
BAKER: 30HO 2 spindle inverted
BAKER: 21T Upright H.D.
FOSDICK: #48M Upright H.S.
PROVIDENCE ENG: FV-6 Sensitive 6-spindle
PRATT & WHITNEY: ⅛ thru 50 Deep Hole Reamer
ARCHDALE: Radial, all sizes (New)

SCREW MACHINES
ACME-GRIDLEY: RA6 9/16" & 1" 6-spindle

MISCELLANEOUS
CAMPBELL: #425 Cutslator
WILLIAMS: 10" Pipe Cut-Off
TANNEWITZ: GH-36 Band Saw
RANSOME: #30 Welding Positioner
KENT: 5¾" Bar Pointer
MATTHEWS: 79A Marking
GENERAL: #33 Flexible Press
DENISON 918-AM Hydr. Tool Stand
OSBORN: 602 Jolt Rollover

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1—18"x8' AMERICAN Engine Lathe.
1—#3 BARDONS & OLIVER Turret Lathe, complete for bar and chucking, late type.
1—#2MH CINCINNATI Plain Miller.
1—#1 BAKEWELL Tapping Machine, late type.
1—Single Spindle PRATT & WHITNEY profiler, motor-driven.
#2 BROWN & SHARPE Surface Grinder, late type.
1—6"x30" type C Norton plain grinder, 1940.

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BARBER COLMAN Type "T" Taper Spline Gear Hobber

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CINCINNATI 2-24 Plain Auto. Milling Machine

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18"/38"x10' LeBlond Sliding Bed Gap Lathe

20"x62" cc AMERICAN 12 Speed Timken Head Lathe, rapid traverse

20"x96" cc AMERICAN 12 Speed Timken Head Lathe, taper, rapid traverse, 1938

48"x30' NILES Heavy Duty Geared Head Engine Lathe, new 1939, taper, steady rests, MD

No. 2L GISHOLT Turret Lathe, preselector head, bar feed, complete collets, taper, threading attachments, chuck, 1942.

20"x96" NORTON Type A Cylindrical Grinder

4' HAMMOND Jackknife Radial, 1942

36" BULLARD New Era Vertical Turret Lathe

100" SELLERS Vertical Boring Mill, two swivel heads, rapid traverse, New 1935.

84" CONSOLIDATED COLBURN Vertical Boring Mill, 2 swivel heads, rapid traverse, AC—MD

No. 3 CINCINNATI Plain Mill, Vertical Head, 1941

No. 9A MARVEL Automatic Hacksaw, 10"x10" gap, bar feed, MD

No. 512 NIAGARA S.S. Press, 280 tons

O'CONNELL MACHINERY CO.
1825 NIAGARA ST BUFFALO 7, N.Y.

No. 2G B & S Automatic, SPD.
No. OG B & S High Speed Automatic.
No. 2 B & S Surface Grinders.
Seneca Falls 12" x 6' Toolroom Lathe.

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HONES—BARNES Vertical, Model 172 6" stroke, 2" bore.
GRINDER—NORTON 10"x36" Type C Plain Cylindrical
LATHE—FAY Auto, 16"x21" S/N 82431, Mfg. 1942

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#2 Morse Taper, ⅝" Drilling Capacity. Hand Feed to Spindle.
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AUTOMATIC SCREW MACHINE, #00 Brown & Sharpe, Cap. 5/16", Slotting Attachment, Coolant System, etc. THREE.

AUTOMATIC SCREW MACHINE, #00 Brown & Sharpe, Cap. 5/8", Slotting Attachment, Coolant System, etc. TWO.

AUTOMATIC SCREW MACHINE, #2 Brown & Sharpe, Cap. 1", Collet, Collet Chuck, toolposts, Coolant System, etc. FOUR.

AUTOMATIC SCREW MACHINE, #2G Brown & Sharpe, Cap. 1", 2 h.p. 220/440 volts, Collet, Collet Chuck, Coolant System, etc. THREE.

APRON BRAKE, Cerweco 'All-Steel' Hand Type, Capacity—8' x 12 gauge.

PRESS BRAKE, Dreis & Krump 'Chicago' #334, Cap. 60" x 12 gauge, Reeves Drive and 2 h.p., 220/440 volts motor.

BUFFER & POLISHER, U. S. Electrical Multi-Speed Double End #95, 5 h.p., 220 volts, Four Speeds up to 2700 r.p.m. Floor model.

BUFFER & POLISHER, Gardner #3DB Double Spindle with independent 7½ h.p. 220/440 volts motors & controls, Timken Bearings.

Drill, Baker #314 Hvy. Pattern High Speed Vertical Boring & Drilling Machine, 7½ h.p. 220/440 motor, #5 taper, 12 feeds, 6 speeds, 12¼" throat, 3" Capacity in steel.

DRILL, Colburn #2 Manufacturing Heavy Duty All Geared Motor Driven, 3 h.p. single phase motor, reversing controls, #4 taper, 10" throat, 1¼" capacity in steel.

DRILL, Leland Gifford #2LMS, Upright Sliding Head Two Spindle, #2 taper, 13" overhang, Independent 220 volts, 4-speed motors, Indicated spindle speeds.

DRILL, Natco #12 Multiple Spindle Motor Driven, #1 taper, 3 h.p. 220/440 motor, Arranged for 18 spindles, Rectangular head, With Natco 24" Rotary Table.

STRAIGHT BEVEL GEAR GENERATOR 3" Gleason, Serial #18884, NEW—1942, 220/440 volts motors, Gear Cabinet, Full Set of Index Gears, Segments, Auto-Index Attachment, Pneumatic Chuck Equipment, Cutter Setting Gauges & Segment Setting Gauges, Duplete Cutting Cam & Duplete Feed Cam.

SEE PREVIOUS ISSUE FOR MORE COMPLETE STOCK LISTING

BASE PITCH & SPACE MEASURING MACHINE, #337 Illinois, Late Type—Like New, Capacity—12" diameter gear, 15" between centers, Full Set of Off-Set and Straight Contact Fingers, Dial Indicator, Tailstocks and Leatherette Cover.

GRINDER, Cincinnati #EA, 10" x 36" Hydraulic Cylindrical, Filmatic Bearings, 220 volts motors, Built-in electrics, Hydraulic Infeed.

GRINDER, Cincinnati #2 Universal Cutter & Tool, Model #EM, New in 1943, 220/440 volts motors, Cylindrical Grinding Attachment & lot of Equipment.

GRINDER, Bath 10"x25" Motor Driven Universal Surface, 220/440 volts motor with centralized push button controls, Internal Grinder Attachment & Steady Rest, etc.

KEYSEATER, Mitts & Merrill #5 Giant Motor Driven, 220/440 volts motor, Capacity—24" long, 3" wide keyway, Automatic Feed.

LATHE, Putnam Extension Bed Q.C.G. Gap Lathe, 28"/58" x 84"/110", 7.5 h.p. 220/440 volts motor, 2-3/32" hole thru spindle, Large faceplate, etc.

LATHE, Bridgeport 32" x 16' Q.C.G.Grd. Hd., 110" Centers, 2⅛" hole thru spdle. 15 h.p. 220/440 volts. Internal geared faceplate.

LATHE, Hardinge #59 High Speed Second Operation Machine, 1" Collet Cap, Automatic Collet Mechanism, collets, collet chucks, etc. FOUR.

TURRET LATHE, Gardner & Oliver #7 Universal Grd. Hd. Ram Type, Hydraulic Speed Selector, 2½" Cap. 10 h.p. 220/440 motor, With Chuck, toolholders, etc.

TURRET LATHE—Warner Swasey #1-A Model #M-479 Universal 12 Speed Grd. Hd. Hvy. Duty Bar Feed Saddle Type, Cap.—2½", Power Screw Bar Feed & large lot of tooling, 220/440 volts.

MILLING MACHINE, U. S. #MMI-6 Cam Controlled Automatic Horizontal, #40 taper, Late Type, 220/440 motors, TWO.

MILLING MACHINE, Cincinnati #3 Dial Type High Speed Motor Driven Horizontal, 220/440 motor, Range; 34" x 12" x 20".

MILLING MACHINE, Van Norman #3V Ram Type Vertical, Late Type, 220/440 motors, Also stub arbors, arbor, vise, collets & cutters.

POWER PRESS, Bliss #84 S.S.S.A. 56 tons, 10" Stroke, 20" between uprights.

POWER PRESS, Bliss #75½ S.S.S.A. 120 tons, 5½" Stroke, 24" between uprights.

POWER PRESS, Bliss #3A S.S. Dble. Crank S.A. Grd. 45 tons, 4" stroke, 36" between uprights.

POWER PRESS, Toledo #91C S.S. Dble. Crank, S.A. Grd. 50 tons, 4" Stroke, 36" between uprights.

WHEEL PRESS, Niles B & Pond 200 Tons Hydraulic Horizontal, 46" between strain bars, Two Plunger Type, 7.5 h.p. 220/440 motor.

POWER PRESS, Bliss-Consolidated #27 Open Back Gap Frame Sgle. Crank Sgle. Action Back geared, 175 tons, 10" stroke, Bed area—24" x 42", With Roll Feed and Roll Straightener.

POWER PRESS Ferracute #86 Double Crank Sgle. Action, S.S. Geared, 85 tons, 1¾" stroke, Bed area —61½" x 27½".

POWER PRESS — Bliss-Consolidated #103-B Straight Side Dble. Crank Single Action, 45 tons, 6" stroke, Bed area—24" x 41", 15 h.p. 220 motor.

WIG FEATURES

#50 EXCELLO PRECISION THREAD Grinder (Largest made) will Thread 3" shaft any length through spindle, 68" length, 12" dia. on centers.

#124 Gardner Disc Grinder with Rotoclone
Model 30A Fosdick Jig Borer
15" Gleason Quenching Press
32" Gould & Eberhardt Industrial Shaper
500 Ton Erie Hyd. press 40x54", 28" st.
8"x108" LoSwing Lathe, AC motors
1712 Michigan Univ. Rollerving Lathe

#17 Gleason Hypoid Gear Grinder for fast precision finishing of hardened spiral bevel, zerol bevel, & hypoid gears & pinions.

2H K & T horiz. miller, double overarm
1404 K & T bed type prod. mill, late type
34-36 Cinc. Hydromatic Duplex mill, late
#4 W & S turret lathe, bar & chucker ser. 757394
Model 2L Gisholt 16" turret lathe
#18 Marvel Roll Stroke Heavy Duty Hyd. hacksaw

96" Ohio Extra Heavy Duty rotary table hand & power feed.

10x36" Cinc. "EA" Hyd. Cyl. Grinder, late

T. R. WIGGLESWORTH MCHRY. CO.
1719 Superior Cleveland, Ohio

HEADLINERS
ALL NEW SINCE 1940

MILLING MACHINES

#2 Cincinnati High Speed Dial Type Universal, div. hds.

Type "P" Ohio Production, 36" table travel

#2-24 Cincinnati Automatic "Rise & Fall"

#1-12 Cincinnati Plain Automatic, backlash eliminator

#2RV Kent-Owens Hand, variable speed drive

TURRET LATHES

#4-L Gisholt Heavy Duty Saddle Type, 9¼" hollow spindle, hardened ways, threading attachment

#3 Gisholt Universal, complete bar feed

#3 Gisholt Universal, chucking work

#601-DD Oster "Rapiduction", bar feed

MISCELLANEOUS

10"x24" Landis Type "C" Hydraulic Univ. Grinder

#35-L Ex-Cell-O Precision Thread Grinder

6"x36" Model LT Lees-Bradner Thread Miller

16"x21" Fay Automatic Lathe

MANY OTHER MACHINES IN STOCK

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10' Cincinnati Hypro Vertical—1943

GEAR MACHINERY

#72 Fellows Gear Shaper
3" Fellows Fine Pitch Gear Shaper
#7125A Fellows Gear Shaper

GRINDERS

6"x18" Cincinnati Plain
6"x18" Norton Plain Hydraulic
6"x20" Norton Plain, 1940
10"x18" Norton Type C Plain Hydraulic, 1942
10"x36" Norton Type C Plain Hydraulic
14"x48" Cincinnati Plain, 1942
#70A Heald Internal, 1941
12" Model A3 Arter Rotary Surface
8" #20 Heald Rotary Surface
#25A Heald Hydraulic Rotary Surface
24"x24"x120" Mattison Surface, 1945
#2 Cincinnati Centerless, 1941
#1 Brown & Sharpe Universal, 1941
#95—66" Bridgeport Face, 1942

NUT AND BOLT MACHINERY

#150C Manville 555D Header
#188F Manville 555D Ball Header
#0 Waterbury Farrel D55D Toggle Header
¼" National Precision Nut Tapper
#2 Waterbury Farrel Nut Tapper
#2B Manville Horizontal Thread Roller
#2C Manville Horizontal Thread Roller
#10 Waterbury Farrel Inclined Thread Roller

PLAIN MILLERS

#2SP Van Norman, 1941
#3SP Van Norman, 1941
#2H Kearney & Trecker, 1941
#2 Cincinnati, 1942
#4 Cincinnati
#26 Van Norman, 1943

UNIVERSAL MILLERS

#2A Brown & Sharpe, 1942
#35U Van Norman, 1943

VERTICAL MILLERS

#00 Cincinnati, 1940
#2 Cincinnati Medium Speed Dial Type, 1942
#2 Standard Brown & Sharpe, 1942
#3V Van Norman, 1943

PRODUCTION MILLERS

#34-36 Cincinnati Hydromatic, rise and fall, 1941
#4-36 Cincinnati Hydromatic, 1942
#5-48 Cincinnati Hydromatic, 1943
#58-96 Cincinnati Hydromatic, 1940
#33B Sundstrand Duplex

PLANERS

42"x42"x18' Gray
120"x96"x28' Cincinnati

TURRET LATHES

#1A Warner & Swasey Universal Geared Head, 1940
#1 Warner & Swasey Electric Head, 1940
#2A Warner & Swasey Universal Geared Head
#4 Warner & Swasey Universal Geared Head, 1942
#1L Gisholt Universal Geared Head, 1942
#5 Gisholt Universal Geared Head
#4L Gisholt Universal Geared Head

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LATE TYPE MACHINES

36-90 Cincinnati Hydromatic DUPLEX Miller
9-J Gorton Vertical Miller with Electric Duplicator
#3MS Cincinnati Dial Type Plain Miller
BL-3620 Keller Duplicator
BL-2416 Keller Duplicator
61-A Fellows Gear Shaper

HAZARD BROWNELL MACHINE TOOLS, INC.

350 Waterman St. Providence, R. I.

No. 25T G. & L. 2½" table Hor. Mill, 1942
3" Univ. Table Mill, 48" vert., 72" hor., '43
4" Univ. Table Mill, 60" vert. 98" hor., '43
36" & 42" Kings Side Hd. Vert. Mills, '43
Nos. 1A & 3 W. & S. Turrets, bar & chuck
Nos. 3 2MH Cinci. Pl. Dial Millers, late
Nos. 3K & 3H K. T. Pl. Dial Millers, late
No. 36 Van Norman Pl. Miller, ram, '43
No. 3G Kempsmith Univ. Miller, 1943 (3)
No. 2416 Keller Duplicator, 3 dim., 3 spin.
No. 9J Gorton Elec. Duplicator, 1944.
Gear Cutter, No. 13 B. & S., spur & bevel
30"x120" cen. Axelson Lathe, T.A.
30"x120" Hanchett Planto Surface Grinder
No. 2 Stand. K. & T. Univ. Miller, Timken
Gear Cutter, 3-36" B. & S. Spur, Late
12"x48" Hanchett Vert. Spin. Surface Grinder
96"x96"x24' N.B.P. Planer
6' 17" col. Carlton Radial, M on arm
14"x54" cen. Monarch, T.A., 1945.

BENNETT MACHINERY CO.

30 Church St., New York 7, N. Y.

LATE MODEL TOOLS

No. 4H K&T Universal Miller, 1943

3K K&T Plain Miller

No. 2D KEARNEY & TRECKER Rotary Head Tool & Die Miller.

No. 22VS REED PRENTICE Vertical Miller & Die Sinker, 1948.

No. 2BL NATCO "Holesteel" Multiple Spindle Drill, rectangular head.

16"x30" and 54" MONARCH TOOL-ROOM Lathes.

20" G&E Industrial Shaper.

12"x30" MONARCH Model "KK" Engine Lathe.

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WOODWARD 48x48x12' Double Housing, two rail heads, one side head, AC belted motor drive
WOODWARD, 36x36x12' Double Housing, two rail heads, one side head, V-belt motor drive
GRAY, 36x36x10' Double Housing, two rail heads, belt driven
GRAY, 42x30x10' Double Housing, Widened Pattern type, two rail heads, one side head
FLATHER, 36x36x10' Double Housing, Motor driven, two rail heads
GRAY, 24x24x6' Double Housing, motor driven, single head on cross rail

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TOOL & CUTTER GRINDERS

No. 2 Cincinnati Universal, m.d., latest type
No. 2 LeBlond Universal, m.d.
No. 10 Brown & Sharpe, m.d., latest
No. 13 Brown & Sharpe, m.d., latest
Cincinnati Monoset, m.d.
Sterling Tool & Cutter, m.d.
Gleason Cutter, m.d.
No. 2B Sellers Drill, m.d.
No. 12M Grand Rapids Tap, m.d.
No. 4T Sellers Tool, m.d., latest
No. 6T Sellers Tool, m.d., latest
1½ H.P. Grand Rapids Double End Drill Grinder
Barber-Colman Model HRB Combination Cutter Sharpener, m.d., late

MANUFACTURING LATHES

No. 3A Lodge & Shipley Do-matic, m.d., late type
No. 4 LeBlond Boring Lathe, 37" bed, 13" hole
No. 9, 12 LeBlond Multi-Cut, m.d.
3½x16", 3½x80", 4x90", 6x84" LoSwing, m.d.
8x132" LoSwing, m.d., latest
9x12" Sundstrand, s.p.d.
11x18" LoBlond Rapid Production, m.d.
12x18" centers Monarch Model 5T, m.d.
13"x24" LoBlond Rapid Production, Timken, latest
13"x24" Coulter Automatic Threading, m.d.
13x36" LoBlond Rapid Production, Timken, latest
13x48" Coulter Automatic Threading, m.d.
16"x6' LoBlond Rapid Production, m.d.
16"x8' Lodge & Shipley Simplified Mfg., cone, motorized
17"x6' LoBlond Automobile Mfg., cone
17"x8' LoBlond Automobile Mfg., cone
20"x8' LoBlond Mfg., m.d.
21"x8' LoBlond Turret Lathe, cone
Niles-Bement-Pond Quartering Machine, m.d., new
Schauer Type NA 2B Speed Lathe, m.d.

ENGINE LATHES

10x20" centers Monarch EE Geared Head, m.d., latest
10x24" Logan, cone, motorized
12x36" centers American Geared Head, m.d., late
13x30" centers Pratt & Whitney Model B, m.d., taper
13x48" centers Pratt & Whitney Model B, m.d.
14x36" Lodge & Shipley Selec. Head, m.d., latest
14"x54" centers Lodge & Shipley, m.d., latest
14"x6' bed Hendey Geared Head, m.d., taper
14"x6' Lodge & Shipley Geared Head, m.d.
14"x6' Pratt & Whitney, cone
14"x6' LeBlond, cone
14"x6' Sidney Geared Head, m.d.
14"x6' Springfield Geared Head, m.d., taper
14"x8' Prentice, m.d., taper
14"x8' Pratt & Whitney, cone
15"x30" centers LoBlond Regal, m.d.
15"x6' LoBlond Geared Head, m.d.
16"x30" Reed-Prentice, m.d., latest
16"x36" Pratt & Whitney Geared Head, m.d.
16"x58" centers Pratt & Whitney, cone, motorized
16"x6' Bradford, cone
16"x6' Hendey Geared Head, m.d.
16"x6' Hendey Yoke Head, taper
16"x6' bed LeBlond, cone
16"x6' Lodge & Shipley Selec. Head, m.d.
16"x6' bed Monarch Geared Head, m.d.
16"x8' Lodge & Shipley, cone, motorized
16"x8' Monarch, m.d. in base, taper
16"x8' Monarch, cone
16"x8' Sebastian, cone
16"x10' Hendey Yoke Head, taper
16"x14' Greaves Klusman, m.d. in leg, taper
17"x54" centers LoBlond Regal, m.d., taper
17"x6' LoBlond Geared Head, m.d.
17"x8' LoBlond Geared Head, m.d., taper
18"x48" centers Lodge & Shipley, m.d., taper
18"x52" centers American Geared Head, m.d., taper
18"x5' LeBlond Geared Head, m.d.
18"x6' bed Lodge & Shipley, new, motorized
18"x6' Monarch Geared Head, m.d.
18"x7' Greaves-Klusman, m.d.
18"x7' Hendey Geared Head, m.d., taper
18"x8' Advance, cone
18"x8' American Geared Head, m.d.
18"x8' Champion, cone
18"x8' Hendey Geared Head, m.d.
18"x8' Lodge & Shipley Selec. Head, m.d.
18"x8' Lodge & Shipley, cone
18"x8' Whitcomb-Blaisdell Geared Head
18"x12' Bradford, cone, motorized
18"x10' Cincinnati, cone
18"x10' Lodge & Shipley Selec. Head, m.d.
18"x10' Greaves-Klusman, bolted m.d.
19"x8' bed LeBlond Geared Head, m.d., taper
20"x8' American Geared Head, m.d., taper
20"x8' Cisco, cone
20"x8' Greaves-Klusman G.H., m.d. in leg
20"x10' Boye & Emmes Geared Head, m.d.
20"x10' bed (96" centers) Monarch Geared Head, m.d., taper
20"x10' Sidney Geared Head, m.d.
20"x11' Lehmann Geared Head, m.d., taper
22"x70" centers Greaves-Klusman Geared Head, m.d., taper
22"x8' Lodge & Shipley, cone
22½"x10'6" Greaves-Klusman, bolted m.d.
23"x12' LeBlond Geared Head, m.d., taper
24"x10' American, m.d.
24"x10' American, cone
24"x10' Greaves-Klusman Geared Head, m.d., taper
24"x10' Lodge & Shipley, cone
24"x12' Bridgeford Geared Head, m.d., taper
24"x12' LeBlond, cone
25"x10' LeBlond, cone
26"x8' Bridgeford Geared Head, m.d.
30"x12'6" Niles-Bement-Pond, m.d., taper
24"x22' American Geared Head, m.d., taper
32"x24' bed Lehmann Geared Head, m.d., taper, latest
30"x13'6" Niles-Bement-Pond, m.d.
32"x12' Lehmann Hydratrol Geared Head, m.d., taper, latest
33"x12' Greaves-Klusman, cone, motorized, taper
36"x36'6" Niles Heavy Duty, m.d., latest, 2 carriages
48"x12' bed American, m.d.

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio — McElrose 1241 — CABLE ADDRESS EMCO

UNUSUAL VALUES

Milling Machines—No. 1 Universal, No. 1 American (new) plain, No. 1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe No. 3—20" Gould & Eberhardt 42".

Grinders—Cylindrical B & S No. 11, Planer type 16"x36" Surface 13"x63", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x8', 8', 10'—16"x6', 3', 10'—18"x6', 8', 10'—28"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized.
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Planers—Single head 24"x6', 24"x8', 26"x8'.

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16" Bullard Mult-Au-Matic, 6 Spdl. 1941.
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1⅝" Greenlee, 6 spindle, 1942.

BOLT MACHINES

No. 500C Manville Thread Roller. Latest.
No. 250C Manville Header, 888D. Latest.

BORING MACHINES

62" King Vertical, 1942.
47A & 48A Head Single End, 1943.
No. 46B Heald Single End, 1940.

DRILLS, RADIAL

5' 15" Cincinnati-Bickford, 1942.
5' 15" American Hole Wizard, 1941.

GEAR EQUIPMENT

No. 6 & 17 Gleason Testers, 1942.
8" Red Ring Internal Shaver. Late.
No. GCL Red Ring Shaver, 1942.
No. 624A3 Fellows Side Trimmer. New.
No. 04SA3, 615A & 61A Fellows, 1944.
No. 712 & 72 Fellows Shaper, 1943.
Vinco Spline & Gear Grinder 1942.
Red Ring Univ. Checker.

GRINDERS, CYLINDRICAL

25" x 48" Landis, Crankshaft. Like New.
16" x 30" Cincinnati Plain, 1942.
12" x 48" Cincinnati Univ. 1943.
10" x 72" Landis Plain, 1942.
10" x 18" Norton Plain, 1942.

GRINDERS, INTERNAL

No. 72A3 & A5 Heald Plain, 1944.
No. 5 & 16A22 Bryant. Latest.

GRINDERS, SURFACE

No. 22 & 25A Heald Rotary, 1943.
6" x 18" Norton Vertical Hyd. 1941.

LATHES, ENGINE

42" x 192" Axelson, 1942.
36" x 12' LeBlond, 1942.
27" x 96" LeBlond, 1942.
18" x 54" Lodge & Shipley, 1943.
14" x 30" Bradford, 1942.

LATHES, PRODUCTION

No. 3A L&S "Duomatic", 1943.
8" x 100" Lo-Swing Semi. Auto. 1942.
Model 8 & 10 Sundstrand, 1942.
14" x 42" Monarch "Magna-Matic". 1941.

LATHES, TURRET

42" x 36" Bullard Vertical, 1943.
No. 1 & 8½" x 24" Acme Univ. 1943.
No. 2 & 4 Warner & Swasey, 1943.
No. 3, 5 & 7 Barbina & Oliver, 1942.

MILLS, PLAIN

No. 5 Cincinnati, 1943.
No. 4K Milwaukee, 1943.
No. 32 Van Norman, 1942.
No. 2HL Milwaukee, 1943.

MILLS, PRODUCTION

No. 2-24 Cin., Plain and R. & F. 1943.
No. 1-16 & 2-20 Kent Owens 1942.
M-18 Kearney & Trecker, 1943.
No. 1224 Kearney & Trecker. 1942.
No. 3-36 Cincinnati Duplex. R. & F. 1942.
No. 3-36 Cincinnati Hydromatic. 1942.
No. 1-18, 2-18 & 2-24 Cincinnati. 1942.

MILLS, THREAD

12" x 54" Lees Bradner. 1943.
6" x 36" Lees Bradner. 1942.
4" x 9" Hanson Whitney. 1942.

MILLS, UNIVERSAL

No. 2MH Cincinnati. 1942.
No. 2H Milwaukee. 1942.
No 28U Van Norman 1942.

MILLS, VERTICAL

No. 2K & 3H Milwaukee. 1942.
No. 2 Cincinnati. 1942.
No 1 Cleveland 1942.

PRESSES

100 Ton Baldwin Southwork, Hyd. 1941.
100 Ton Hannifin, Hyd., 80C. 1942.
50 Ton Denison, Hyd., Str. 1942.

SHAPERS & PLANERS

48"x48"x16' Cin "Hypro". 1942.
20" Cincinnati Plain. Late.
25" Smith & Mills Univ. 1945.

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9/16" Acme Gridley. Model RA6. 6 spindle.
9/16" National Acme Gridley Model R6 6 spindle.
⅞" and 1¼" Cone 4 spindle.
1-1/6" Cleveland Model M.
1⅝" No. 61 New Britain Gridley 6 spindle.
1⅝" Greenlee 6 spindle.
1⅞" Conomatic 8 spindle.
2"x18" Cleveland Model B
2⅜" Acme Gridley Model RA6. 6 spindle.
4⅛" Conomatic 4 spindle.
No. 16 New Britain 6 spindle chucker.
No. 454 New Britain 4 spindle chucker.
No. 5 DE 2 Potter & Johnston chucker.
8" Bullard Multamatic 6 station.
14"x18" Monarch Mag-na-Matic.
14"x19" Fay
1" Economy bolt Lead shaver.

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100" Niles-Bement-Pond vertical, extra heavy.
52" King vertical.
36" Bullard vertical turret lathe.
5" Jones floor planes type horizontal.
4½" No. 33 Lucas horizontal.
3&¾" No. 32 Lucas horizontal.
3" No. 31 Lucas horizontal.
3" No. 32 Giddings & Lewis horizontal.
3" No. 3A Universal horizontal.
Nos. 47A & 48A Heald Borematics.
No. 42 Heald Borematic.
No. 112 B Ex-Cell-O.
No. DB 2112 Ex-Cell-O.
No. 1212A Ex-Cell-O 4 spindle.
No. 2 Pratt & Whitney vertical jig borer.
Vernon vertical miller or jig borer.
Munson double end horizontal.
No. 4 HH Baker 2 way horizontal.

PRESSES

No. 3 Consolidated O.B.I.
No. 6 American Con. O.B.I.
Nos. P1, P2, P3, P4 and P5 Ferracute punching.
No. 32 P Toledo Punching.
CA4 Ferracute adjustable knee.
No. 11 Toledo horning.
No. 52 Toledo arch frame.
Nos. 202B & 205C Toledo gap frame double crank.
No. 506 Bliss permanently inclined straight side.
No. 304 Bliss straight side.
No. 73½ Bliss straight side.
No. 75½ Bliss straight side.
Nos. 11½ and 11½C Bliss cam drawing.
No. 2316½ Cleveland 600 ton forging.
No. 27 Bliss 1000 ton coining.
No. E. G. 52 150 ton Ferracute coining.
1000 ton Baldwin Southwark hydraulic.
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No. B4 A Natco Holetapper, 24 spindle.
No. 1 Bakewell precision.
Baush radial arm.
Nos. 2, 2x and 2BG Garvin automatic.

MISCELLANEOUS

No. 18 Economy paper baler.
Model 23 P-60 Logemann scrape baler.
No. 11 Murchey bolt threader long bed.
No. 203 Campbell cut off saw.
Model BG-1 Size 723 Pratt & Whitney die sinker.
No. 14 Mitts & Murrill paper shredder.
No. 6 HS-9 Longelier swager.

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GOULD & EBERHARDT 32" Universal crank "Industrial" (late).

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MILWAUKEE #2K dbl. over. motor in base, wkg. tbl. 56" x 12", range 28" x 10" x 17", rapid traverse (late).
CINCINNATI #3 dial type hi-speed, wkg. table 62½" x 18", range 34" x 12" x 20, rapid traverse (late).
MILWAUKEE 5K dbl. over. motor in base, wkg. table 64½" x 15½", range 34" x 12" x 18", rapid traverse (late).

TURRET LATHES

JONES & LAMSON #5, 2½" cap. ram type Universal bar and chucking (late).
WARNER & SWASEY #3, 1½" cap. #4, 2" cap. #5 2½" cap., ram type Universal, bar and chucking, quantity of tooling.
WARNER & SWASEY #2A, 3½" cap., #3A 4½" cap. saddle type, Universal rapid traverse full length lead screw, bar and chucking (late).

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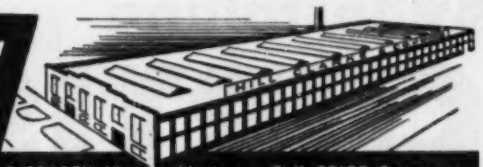

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No. D8 Colburn, No. 6 Morse Taper
No. 200—26" Defiance #5 Taper (1943)
No. 1-LMS Leland-Gifford's (1942)
No. 2-LMS Leland-Gifford's (1942)
No. 48L Natco 36 Spdl. (1943)
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3'-10" Fosdick
4'-11" Carlton Radial Drill
5' Western Heavy (1942)
6'-17" Fosdick Hyd. Economax Radial

GEAR MACHINES
No. 61-A Fellows Gear Shaper (1942)
No. 71-A Fellows Gear Shaper (1942)
No. 7125 Fellows (1943)
No. 72 Fellows Gear Shaper
No. 16 HS Gould & Eberhardt
No. 12 Gleason Bevel Gear Generator
72" Cincinnati Gear Cutter
No. 3 Barber-Colman Hob Sharpener

BORING MACHINES
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No. 32 Giddings & Lewis, 3½" Bar
No. 2 Lambert 4" bar
No. 48-B Heald Bore-Matic (1942)
No. 112—C Excello 2 Spdl. (1942)
42" Bullard New Era
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72" Niles-Bement-Pond
84" Betts, M.D.

GRINDERS
3"x12" Brown & Sharpe No. 5 (1944)
4"x12" Landis, Model H (1942)
8"x18" Norton Type C Plain (1943)
6"x36" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1943)
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No. 34 Abrasive Surface Grinder (1943)
No. 11-16 Blanchard
No. 36-A Hanchett Rotary Surf. (1942)
No. 72-A-3 Heald Internal (1942)
No. 72-A-5 Heald Internal (1942)
No. 16—38 Bryant Internal Gdr.

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18"x8' American, Gdr. Head, M.D.
18"x8' American Gd. Hd.
36"x16' Betts—Bridgeford Grd. Head
38"—48"x16' Lehman Hydratrol (1945)
8"x15" Sundstrand, Model B (1943)
10" Sundstrands (1942, 1943)
20" Fay Automatics (1943)
Model R-14 Seneca Falls Le-Swing
No. 3 Warner & Swasey
No. 4 Gisholt Univ. Turret Lathe (1942)
No. 4B Libby, Bar Feed (1942)
No. 5 Bardons & Oliver (1943)
No. 2-A Warner & Swasey (1941)
No. 2-A Warner & Swasey (1941)
No. 1-H, 6" Libby
No. 1-H Libby, Extra Long Bed (1942)

MILLING MACHINES
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No. 3B Milwaukee Plain
No. 2M Cincinnati Vert. (1941)
No. 3 Cincinnati H.P. Vertical
No. 1-18 Cincinnati Mfg. (1943)
No. 2—18" Cincinnati Rise & Fall (1941)
No. 2—18" Sundstrand-Electromil (1942)
No. 2-24 Cincinnati
No. 4-48 Cincinnati Hyd. Tracer (1943)
No. 34-48 Cincinnati Hyd. Duplex (1943)
No. 45-48 Cin. Hyd. Tracer (1941)
No. 56-72 Cincinnati Hydromatic
No. 56-90 Cincinnati Hydromatic
4½"x12" Pratt & Whit., Model C Thread Mill
6"x36" Lees-Bradner—Model HT (1943)
10"x48" Hanson-Whitney Thread (1942)
12"x24" H.T. Lees-Bradner (1942)
24"x24"x12' Ingersoll Adj. Rail Slab Miller
36"x24"x12' Ingersoll Duplex Miller (1946)
No. 10 Ingersoll 72"x6' Travelling Col. Face Millers (1942)
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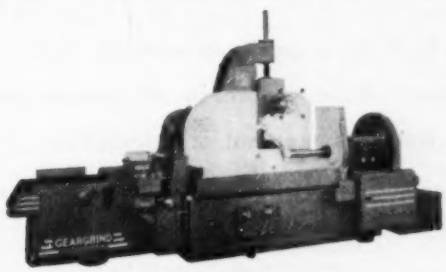

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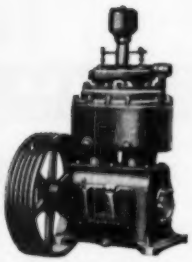

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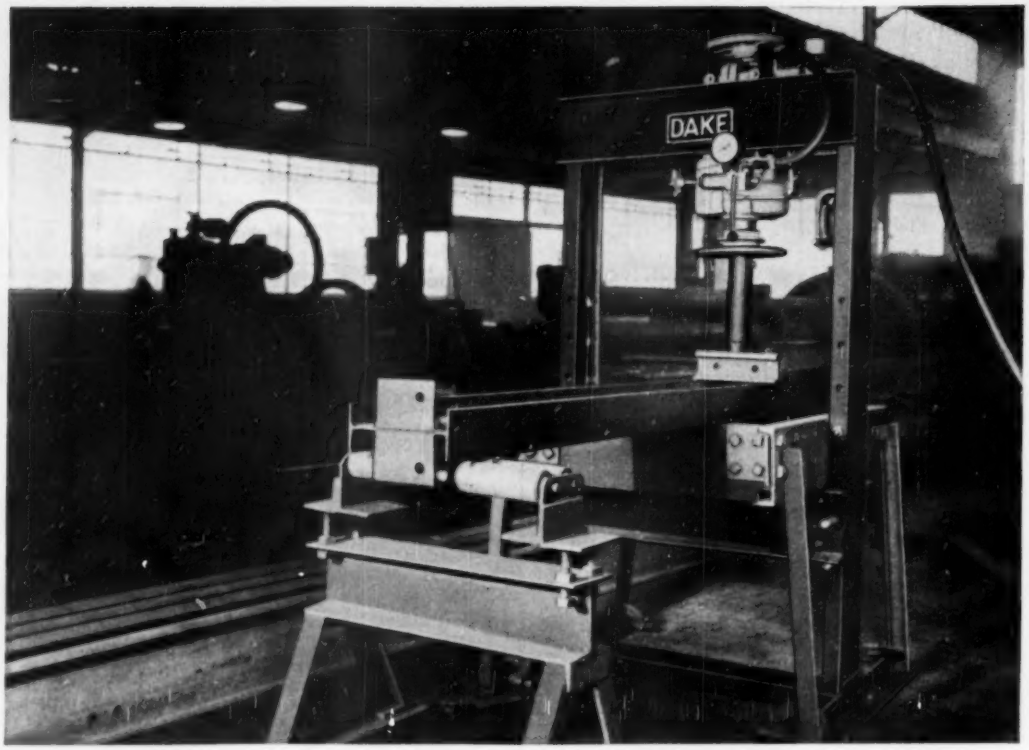


Straightening Time Cut 66%

in Steel Fabricating Plant by Using a Standard Model Dake Press

When a steel fabricating company recently sought a faster method for straightening I-beams and channels after welding, first reports indicated that a high-priced bulldozer would be required or that special equipment would have to be built for the job.

Dake engineers advised otherwise: "If you will equip our regular 50PA Air-Operated Press with a special table and screw nose," they said, "you should be able to materially reduce your straightening costs on all of your structural work." They bought the press and adapted the press to the job. (See illustration above.) The result . . . straightening time was sliced 66%; and they tell us the press paid for itself in the first two months of use.

If you have any kind of straightening, bending or pressing jobs where pressure is to be applied to metals, plastics, wood, etc., consider a regular Dake press first. If a regular model will not work satisfactorily, we will tell you so and will be glad to quote on custom-built equipment.

The complete line of regular-model Dake presses is illustrated and described in the folder which we invite you to send for . . . now.

Write for this Folder

Dake Engine Company, 636 Seventh St., Grand Haven, Michigan

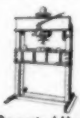
DAKE
arbor and hydraulic
PRESSES

Single Leverage

Ratchet Type

Combination

Elec-Draulic


Hand-Operated Hydraulic

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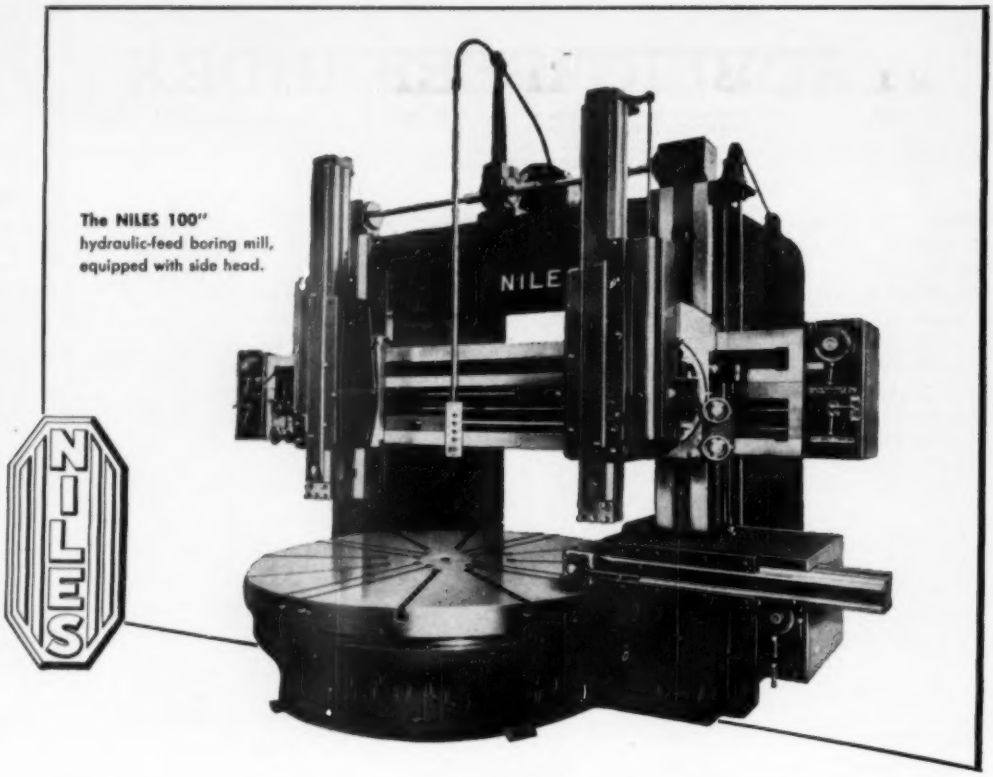

The NILES 100" hydraulic-feed boring mill, equipped with side head.

NILES hydraulic-feed boring mills

Massive construction of Niles boring mills assures ample rigidity to take the stresses of high-speed cutting—yet with no loss of accuracy. You will get considerably faster boring and turning, particularly with tungsten-carbide tools.

With fingertip control of the hydraulic feed, your operator can effortlessly and efficiently operate his mill. He has, for example, infinite feed selection while the machine is running—he can make fast tool placements. Reduced operating fatigue will tend to improve his accuracy.

Eighty years of building large boring mills stand behind these new Niles machines. You will find them precision products in every respect, designed to give you better production—consistently.

* * *

Niles Vertical Boring Mills are built in all standard sizes from 72 inches up, with either hydraulic or mechanical feed and with or without side head. For further information, call the Lima-Hamilton sales offices in New York, Chicago or other principal cities, or write directly to Lima-Hamilton Corporation, Hamilton, Ohio.

LIMA HAMILTON CORPORATION

DIVISIONS: *Hamilton, Ohio* — Niles Tool Works Co.; Hooven, Owens, Rentschler Co. *Lima, Ohio* — Lima Locomotive Works, Inc.; Lima Shovel and Crane Division. *Middletown, Ohio* — United Welding Co.

PRINCIPAL PRODUCTS: Niles heavy machine tools, Hamilton diesel and steam engines, Hamilton heavy metal stamping presses, Hamilton-Kruse automatic can-making machinery, Locomotives, Shovels and cranes, Special heavy machinery, Heavy iron castings, Weldments.

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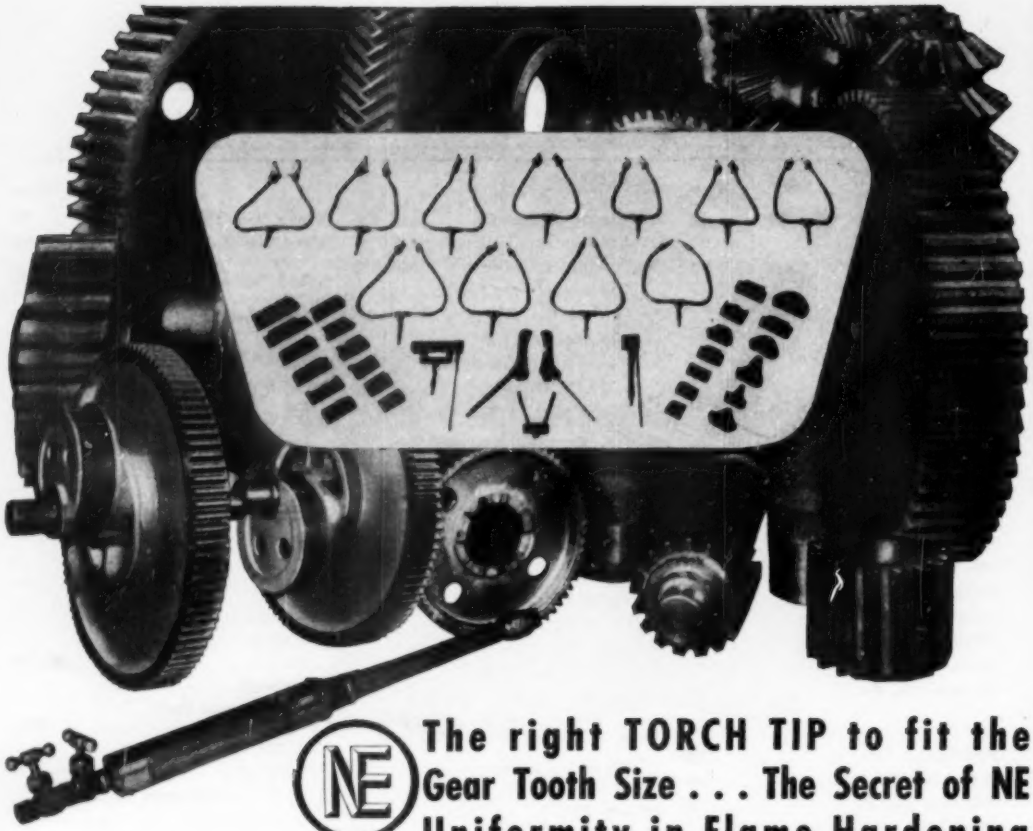
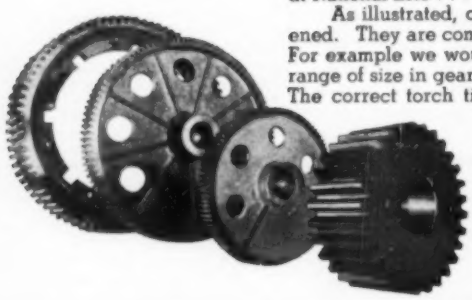


The right TORCH TIP to fit the Gear Tooth Size . . . The Secret of NE Uniformity in Flame Hardening

In the Flame Hardening heat treatment of Neloy or Neloy Moly Alloy Steel gears for the machines of industry, the right torch tip to fit the tooth size is of prime importance. Penetration of hardness to the proper depth for a given size of gear tooth, and core toughness can be obtained uniformly in no other way. Directing the flame to the teeth from a torch tip that fits the tooth size is assured at National-Erie . . . It is a standard "Must" that is never overlooked.

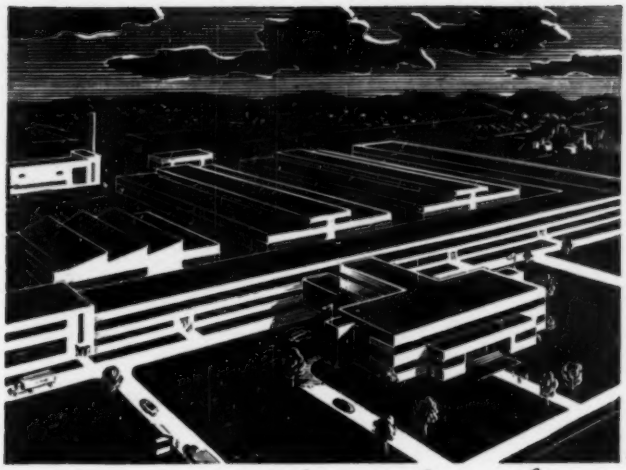
As illustrated, our torch tips are developed to fit the tooth size to be hardened. They are comparable in sizes to the standard range gear cutters or hobs. For example we would use the same tip for a 1 D.P. and 3" C.P. tooth. Each range of size in gear teeth requires a torch tip that fits the tooth to be hardened. The correct torch tip plus National-Erie skill in flame hardening assures the combination of a high surface hardness comparable to the carburizing or case hardened treatment, with a core toughness of a fully quenched medium carbon alloy steel.



A range of torch tips has also been developed by our engineers with the same care, for the flame hardening of track wheel treads and rope sheave grooves. They also are illustrated. Full details are yours in Bulletin No. 9. Write for it.

NATIONAL ERIE CORPORATION

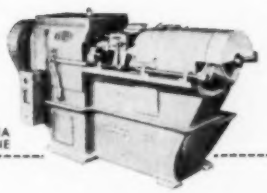
ERIE, PENNSYLVANIA • U. S. A.



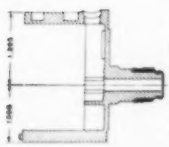
Keenly competitive modern plants have set a single standard for machine tool investments— cost-per-piece— plus sustained machine efficiency.

The reason for insistence on this scientific approach is obvious: the *right* machine pays for itself and begins producing sustained profit in a matter of months, weeks, even days.

New Britain Automatics are designed and built with *sustained low cost-per-piece* as the first consideration.



NEW BRITAIN MODEL 23A
AUTOMATIC CHUCKING MACHINE



A New Britain Model 23-A four spindle tool rotating chucking machine turns out the part sketched, which is made from zinc alloy SAE Specification 903. Ten operations are performed, including turning, facing, chamfering, boring, grooving and threading. In turning the outside diameter for threading, concentricity with the previously finished inside diameter is assured by the use of a pilot tool. 742 pieces are completed hourly — one every 4.8 seconds.

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

650HF1

MULTIPLE SPINDLE AUTOMATIC SCREW AND CHUCKING MACHINES • SINGLE AND DOUBLE END PRECISION STRAIGHT AND CONTOUR BORING MACHINES • LUCAS PRECISION HORIZONTAL BORING, DRILLING AND MILLING MACHINES

Rigid rule for spindles– TIMKEN® bearings

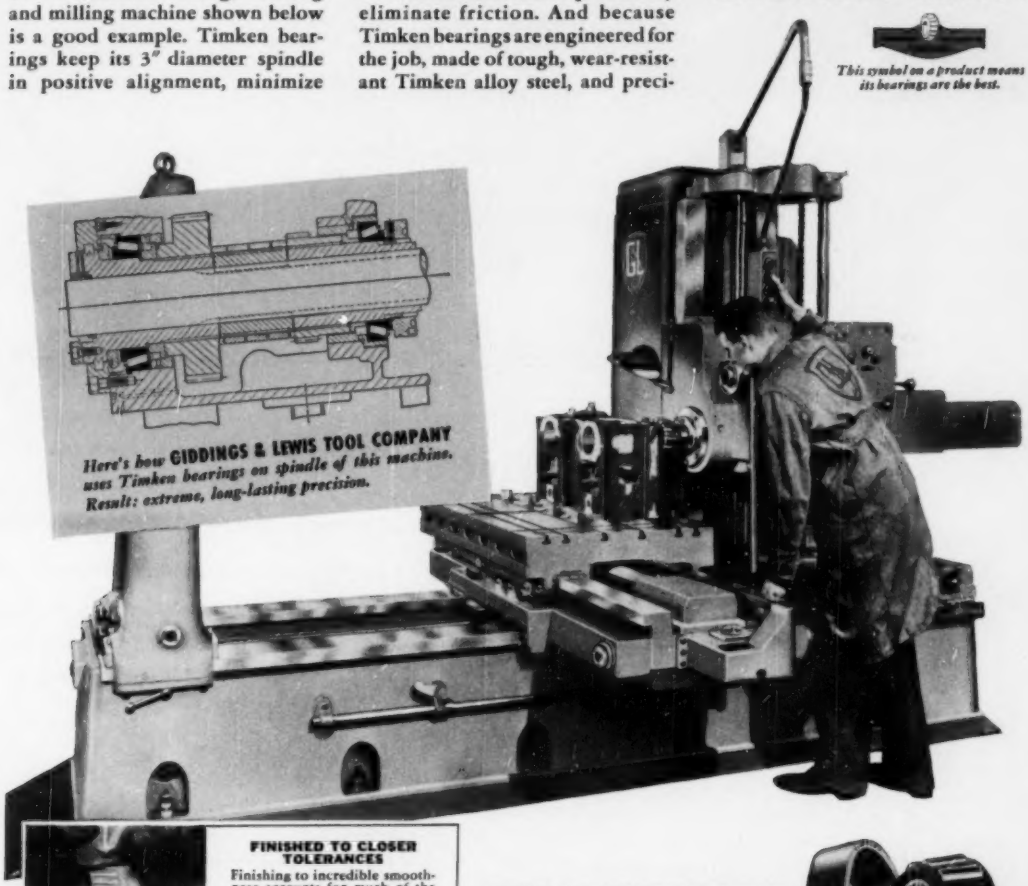
YOU get the kind of spindle rigidity you want for extreme, lasting precision by mounting the spindle on Timken® tapered roller bearings. That's why most machine tool manufacturers make it a rule to use Timken bearings.

The new Giddings and Lewis 300 horizontal boring, drilling and milling machine shown below is a good example. Timken bearings keep its 3" diameter spindle in positive alignment, minimize deflection and end-movement.

Their tapered construction takes loads from any direction and permits accurate preloading to any degree wanted. Their line contact between rollers and races provides extra load-carrying capacity. Their true rolling motion and extremely smooth surface finish practically eliminate friction. And because Timken bearings are engineered for the job, made of tough, wear-resistant Timken alloy steel, and precision-manufactured, they normally last for the life of the machine.

Make sure your machine tools have the fine, long-term accuracy that only Timken bearings can give. Use only bearings that bear the trade-mark "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



Here's how **GIDDINGS & LEWIS TOOL COMPANY** *uses Timken bearings on spindle of this machine. Result: extreme, long-lasting precision.*

FINISHED TO CLOSER TOLERANCES

Finishing to incredible smoothness accounts for much of the precise, smooth rolling performance of Timken bearings. This honing operation is typical of the amazingly accurate manufacturing methods at Timken.

The Timken Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◫ AND THRUST →◫← LOADS OR ANY COMBINATION →✳←